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TIONAL AERONAUTICS AND SPACE ADMINISTRATION

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Significant changes in the pricing schedule for printed ("stocked") reports sold by the National Technical Information Service are effective with this issue. Prices based on this schedule are given in the citations of NASA printed reports and are explained in the Introduction. The new price schedule is not retroactive to previously announced reports.

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INTRODUCTION

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The National Aeronautics and Space Administration makes the results of worldwide research and development activities in aeronautics, space, and supporting disciplines promptly available to participants in its programs. NASA's scientific and technical information system now contains nearly a million documents, which are abstracted, indexed, and obtainable through retrieval and dissemination services. These services, which include this abstract journal, *Scientific and Technical Aerospace Reports (STAR)*, are described in a bulletin, *The NASA Scientific and Technical Information System . . . and How to Use It*, available at no charge from the NASA Scientific and Technical Information Facility, P.O. Box 33, College Park, Maryland 20740.

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STAR is a comprehensive abstracting and indexing journal covering current worldwide *report* literature on the science and technology of space and aeronautics. Publications abstracted in *STAR* include scientific and technical reports issued by NASA and its contractors, other U.S. Government agencies, corporations, universities, and research organizations throughout the world. Pertinent theses, translations, NASA-owned patents and patent applications, and other separate documents are also abstracted. Citations and abstracts in *STAR* are grouped in 34 subject categories, although accession numbers run in unbroken sequence through the *STAR* issues, without regard to category assignment.

Certain publications abstracted in *STAR* are given analytic treatment, with citations and abstracts of daughter items following immediately after the parent document. When the subject content of a daughter differs from that of its parent, a cross-reference citation is printed at the end of the category to which the daughter would normally have been assigned.

Five indexes are included in each issue: subject, personal author, corporate source, contract number, and report/accession number. Cumulative index volumes are published semiannually and annually.

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By arrangement between NASA and the American Institute of Aeronautics and Astronautics, the AIAA publication *International Aerospace Abstracts (IAA)* provides parallel coverage of scientific and trade journals, books, and conference papers in the same subject areas as *STAR*. *STAR* and *IAA* are categorized and abstracted in basically identical ways, and documents in both are indexed by terms from the *NASA Thesaurus*. Both journals appear twice monthly, *IAA* being issued on the 1st and 15th of each month.

IAA is available on subscription from the American Institute of Aeronautics and Astronautics, Technical Information Service, 750 Third Avenue, New York, NY 10017, at the following annual rates, postpaid:

Semimonthly issues: United States and possessions, $160; all other countries, $175.
Cumulated (semiannual and annual) indexes: United States and possessions, $100; all other countries, $115.

Combined subscription to issues and indexes: United States and possessions, $250; all other countries, $270.

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Scientific and technical reports produced by NASA and its contractors and grantees, or in conjunction with other Government agencies, and other selected documents released by NASA are identified by an asterisk (*) following the accession numbers (e.g., N73-10205*). Prior to their announcement in *STAR*, these NASA publications are assigned a specific NASA report number, which is shown on the last line of the *STAR* citation. The nature of NASA publications is specified by the report number series, identified by a prefix to the report number: TR-R, TN-D, TM-X, TT-F, CR, or SP. These series refer respectively to NASA Technical Reports, which contain significant and complete contributions to scientific and technical knowledge; Technical Notes, reports of similar quality but lesser scope; Technical Memorandums, reports containing preliminary data or of specialized utility; Technical Translations, information published in a foreign language and considered to merit NASA distribution in English; Contractor Reports, information generated under NASA-sponsored contracts, grants, or interagency agreements; and Special Publications, which include conference proceedings, monographs, data compilations, sourcebooks, special bibliographies, and other publications derived from or of value to NASA activities. Reports in these series that are printed by NASA are often referred to as "low-numbered" or "low series" publications, because the report number is always below 50,000 (8,000 for Technical Translations). Some TM-X and CR reports are numbered above 50,000. These, and TT-F translations above 8,000, are referred to as "high-numbered" or "high series" publications, and are generally available only in microfiche[1] or facsimile reproductions.

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related to aeronautics and space research;

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Documents that cannot be microfiched but for which one-to-one facsimile can be provided are indicated by a plus (+) instead of the # sign. Documents for which neither the + nor # symbol is shown, and for which no availability other than the issuing activity is given, may present unusual problems of reproducibility. The originator of such a document should be consulted as to its availability.

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INDEXING VOCABULARY

The authority for the indexing vocabulary used in the subject index of this issue of *STAR* is the *NASA Thesaurus*. The most recent version is the *NASA Thesaurus—Alphabetical Update* (NASA SP-7040), September 1971, which is available from NTIS as accession number N72-15923 for $6.00 in paper copy. The current cross-reference structuring for each term appears in this volume, together with additional approved terms that may be used in indexing documents announced in other issues of *STAR*. NASA SP-7040 supersedes the first two volumes (subject terms A–Z) of the three-volume *Preliminary Edition of the NASA Thesaurus* (NASA SP-7030), December 1967. Volume III of the Preliminary Edition presented the following aids to vocabulary selection of the 1967 terms: hierarchical display of index terms, category terms listing, and permuted index; this has not been updated but may still be useful.

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Volume 11 Number 21 / November 8, 1973

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02 Aircraft **2493**
Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc.; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

03 Auxiliary Systems **2499**
Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines; hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; 22 Nuclear Engineering; and 28 Propulsion Systems.

04 Biosciences **2500**
Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

05 Biotechnology **2502**
Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

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Includes chemical analysis and identification (e.g., spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

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10 Electronics **2519**
Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

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Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

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Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

13 Geophysics **2528**
Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

14 Instrumentation and Photography **2543**
Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders, transducers; aerial photography; and telescopes and cameras.

15 Machine Elements and Processes **2552**
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18 Materials, Nonmetallic 2561
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Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

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Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

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Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

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29 Space Radiation 2591
Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics, and 24 Physics, Atomic, Molecular, and Nuclear.

30 Space Sciences 2593
Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbits and trajectories. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

31 Space Vehicles 2599
Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

32 Structural Mechanics 2602
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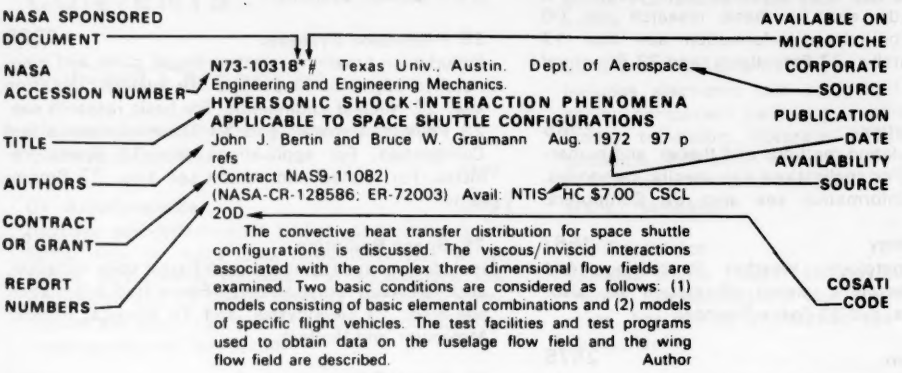
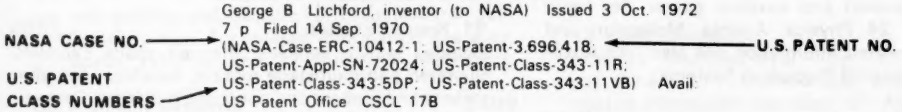


N73-10318*# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
HYPERSONIC SHOCK-INTERACTION PHENOMENA APPLICABLE TO SPACE SHUTTLE CONFIGURATIONS
John J. Bertin and Bruce W. Graumann Aug. 1972 97 p refs
(Contract NAS9-11082)
(NASA-CR-128586; ER-72003) Avail: NTIS HC $7.00 CSCL 20D

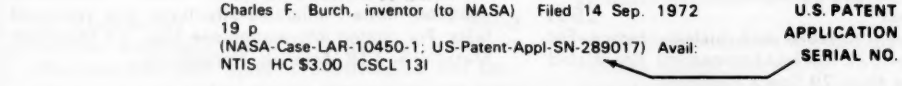
The convective heat transfer distribution for space shuttle configurations is discussed. The viscous/inviscid interactions associated with the complex three dimensional flow fields are examined. Two basic conditions are considered as follows: (1) models consisting of basic elemental combinations and (2) models of specific flight vehicles. The test facilities and test programs used to obtain data on the fuselage flow field and the wing flow field are described. Author

PATENT CITATION



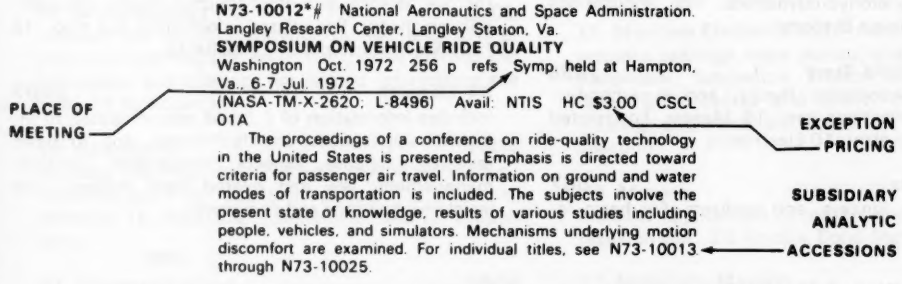
N73-12211* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
ALTITUDE MEASURING SYSTEM Patent
George B Litchford, inventor (to NASA) Issued 3 Oct. 1972 7 p Filed 14 Sep. 1970
(NASA-Case-ERC-10412-1; US-Patent-3,696,418; US-Patent-Appl-SN-72024; US-Patent-Class-343-11R; US-Patent-Class-343-5DP; US-Patent-Class-343-11VB) Avail: US Patent Office CSCL 17B

PATENT APPLICATION CITATION



N73-10504*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
GRINDING ARRANGEMENT FOR BALL NOSE MILLING CUTTERS Patent Application
Charles F. Burch, inventor (to NASA) Filed 14 Sep. 1972 19 p
(NASA-Case-LAR-10450-1; US-Patent-Appl-SN-289017) Avail: NTIS HC $3.00 CSCL 13I

PRIMARY ANALYTIC CITATION AND ABSTRACT



N73-10012*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SYMPOSIUM ON VEHICLE RIDE QUALITY
Washington Oct. 1972 256 p refs Symp. held at Hampton, Va., 6-7 Jul. 1972
(NASA-TM-X-2620; L-8496) Avail: NTIS HC $3.00 CSCL 01A

The proceedings of a conference on ride-quality technology in the United States is presented. Emphasis is directed toward criteria for passenger air travel. Information on ground and water modes of transportation is included. The subjects involve the present state of knowledge, results of various studies including people, vehicles, and simulators. Mechanisms underlying motion discomfort are examined. For individual titles, see N73-10013 through N73-10025.

SUBSIDIARY ANALYTIC CITATION

N73-10014* Douglas Aircraft Co., Inc., Long Beach, Calif.
AN AIRCRAFT MANUFACTURER'S APPROACH TO RIDEABILITY CRITERIA
R. C. OMassey, H. Leve, and J. G. Gaume *In* NASA. Langley Res. Center Symp. on Vehicle Ride Quality Oct. 1972 p 23-49 refs (For availability see N73-10012 01-02)
CSCL 01A

VOLUME 11 NUMBER 21 / NOVEMBER 8, 1973

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbomachinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N73-29993*+ National Aeronautics and Space Administration, Washington, D.C.
AERONAUTICAL ENGINEERING: A SPECIAL BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 32, JUNE 1973
Jun. 1973 116 p refs
(NASA-SP-7037(32)) Avail: NTIS HC $4.25 CSCL 01A

This special bibliography lists 372 reports, articles, and other documents introduced into the NASA scientific and technical information system in May 1973. Author

N73-29994*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECT OF NOZZLE LATERAL SPACING, ENGINE INTERFAIRING SHAPE, AND ANGLE OF ATTACK ON THE PERFORMANCE OF A TWIN-JET AFTERBODY MODEL WITH CONE PLUG NOZZLES
Bobby L. Berrier Washington Aug. 1973 143 p refs
(NASA-TM-X-2724; L-8690) Avail: NTIS HC $4.50 CSCL 01A

Twin-jet afterbody models were investigated by using two balances to measure separately the thrust minus total axial force and the afterbody drag at Mach numbers from 0 to 1.3. Angle of attack was varied from minus 2 deg to 8.5 deg. Translating shroud cone plug nozzles were tested at dry-power and maximum-afterburning-power settings with a high-pressure air system used to provide jet total-pressure ratios up to 9.0. Two nozzle lateral spacings were studied by using afterbodies with several interfairing shapes. The close- and wide-spaced afterbodies had identical cross-sectional area distributions when similar interfairings were installed on each. The results show that the highest overall performance was obtained with the close-spaced afterbody and basic interfairings. Increasing angle of attack decreased performance for all configurations and conditions investigated. Author

N73-29995*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PERFORMANCE COMPARISON OF A LOBED-DAISY MIXER NOZZLE WITH A CONVERGENT NOZZLE AT SUBSONIC SPEEDS
Donald L. Maiden Washington Sep. 1973 27 p refs
(NASA-TM-X-2806; L-8939) Avail: NTIS HC $3.00 CSCL 20D

An investigation to determine the performance, in terms of thrust minus nozzle axial force, of a lobed-daisy mixer nozzle has been conducted in a 16-foot transonic tunnel at static conditions and at Mach numbers from 0.40 to 0.90 at angles of attack from 4 minus to 8. Jet-total-pressure ratio was varied from about 1.2 to 2.0. The performance of a reference convergent nozzle with a similar nozzle throat area and length was used as a base line to evaluate the performance of the lobed-daisy mixer nozzle. The results of this investigation indicate that with no external airflow (Mach number M of 0), and at values of jet-total-pressure ratio between 1.2 and 2.0, the static thrust exerted by the lobed-daisy mixer nozzle is less than that of the convergent nozzle by about 10 percent of ideal gross thrust. About 3.4 percent of the thrust loss was attributed to an unintentional internal area expansion in the fan passage. Author

N73-29996*# Bell Helicopter Co., Fort Worth, Tex.
AN EXPERIMENTAL INVESTIGATION OF VORTEX STABILITY, TIP SHAPES, COMPRESSIBILITY, AND NOISE FOR HOVERING MODEL ROTORS Final Report
James L. Tangler, Robert M. Wohlfeld, and Stan J. Miley Washington NASA Sep. 1973 85 p refs
(Contract NAS1-10946)
(NASA-CR-2305; Bell-299-099-641) Avail: NTIS HC $3.75 CSCL 01B

Schlieren methods of flow visualization and hot-wire anemometry for velocity measurements were used to investigate the wakes generated by hovering model propellers and rotors. The research program was directed toward investigating (1) the stability of the tip vortex, (2) the effects produced by various tip shapes on performance and tip vortex characteristics, and (3) the shock formation and noise characteristics associated with various tip shapes. A free-wake analysis was also conducted for comparison with the vortex stability experimental results. Schlieren photographs showing wake asymmetry, interaction, and instability are presented along with a discussion of the effects produced by the number of blades, collective pitch, and tip speed. Two hot-wire anemometer techniques, used to measure the maximum circumferential velocity in the tip vortex, are discussed. Author

N73-29997# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
ON THE DESIGN CONDITIONS OF A CARET WING
D. Liu Apr. 1973 38 p refs
(AASU-327) Avail: NTIS HC $4.00

The design conditions of the lower surfaces of caret wings of various sweep angles were investigated. The two-dimensional aspect of the problem and the three-dimensional one were analysed separately. The dual design condition is defined, as a result of two dimensionality of the wing. Working charts were prepared for the purpose of specification of the flow field characteristics of the wing. A conically elliptic region was found where shock attachment is possible, when the wing is at a slightly off design condition. Author (ESRO)

N73-29998# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Luftstrahlantriebe.
CALCULATION OF PLANE SUPERSONIC CASCADE FLOW USING THE ANALYTICAL CHARACTERISTICS METHOD Ph.D. Thesis - Aachen Univ. [BERECHNUNG DER EBENEN UEBERSCHALLGITTERSTROEMUNG MIT HILFE DES ANALYTISCHEN CHARAKTERISTIKENVERFAHRENS]

Oanns-Juergen Lichtfuss 16 Feb. 1973 116 p refs In GERMAN; ENGLISH summary
(DLR-FB-73-34) Avail: NTIS HC $8.00; DFVLR, Porz, West Ger. 36,20 DM

Irrotational two-dimensional supersonic flow through straight cascades were calculated using analytical method of characteristics. Different flow configurations were observed whether the axial components of the inlet or outlet flow were subsonic or supersonic. Neutral inlet and outlet characteristics were calculated as well as the asymptotic value of shocks in front or downstream of the lattice-rows. Entropie changes due to the infinite number of cascade shocks were also obtained. Author (ESRO)

N73-29999# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Aeroelastik.

AUXILIARY FUNCTIONS OF THE THEORY OF THE OSCILLATING LIFTING SURFACE WITH LARGE ASPECT RATIO FOR MACH NUMBERS BETWEEN 0 AND 1. PART 1: ANALYTICAL REPRESENTATION [HILFSFUNKTIONEN ZUR THEORIE DER SCHWINGENDEN TRAGFLAECHE GROSSER STRECKUNG IM BEREICH DER MACH'SCHEN ZAHLEN 0 BIS 1. TEIL 1: ANALYTISCHE DARSTELLUNG]

H.-G. Kuessner 1973 32 p refs In GERMAN; ENGLISH summary
(DLR-FB-73-16; AVA-FB-7227) Avail: NTIS HC $3.75; DFVLR; Porz, West Ger. 9,90 DM

Starting from the general linear three-dimensional integral equation of first kind of the unsteady lifting surface theory, an approximative theory of the oscillating lifting surface of large aspect ratio is derived for Mach numbers between 0 and 1. For this purpose three basic assumptions are introduced. The two-dimensional integral equation for the oscillating profile is applied. All auxiliary functions involved in this approximative theory are analytically presented in a rational form suitable for numerical calculations. Author (ESRO)

N73-30000# National Aerospace Lab., Amsterdam (Netherlands).

A METHOD FOR THE CALCULATION OF THE FLOW FIELD INDUCED BY A FREE JET

H. Snel Apr. 1972 25 p refs Sponsored by Neth. Agency for Aerospace Programs (NIVR)
(NLR-TR-72040-U) Avail: NTIS HC $3.25

A method for the calculation of the flow field induced by a jet exhausted from an infinite flat plate into a stagnant medium is presented. The method represents the jet as a body of known dimensions, on which a normal velocity distribution is prescribed to simulate the entrainment. The Neumann problem for the induced flow was solved using a method of singularity distributions. That an accurate representation can be obtained, using a moderate number of panels was shown. The results of the computation are in excellent agreement with measurements. It is argued that the present method may be more successfully extended to the case of a jet deflected by a cross wind, than a different, simpler method (due to Wygnanski) for the calculation of the flow field induced by a free jet. The method is of importance for the description of the flow field about VTOL aircraft configurations with lift jets. Author (ESRO)

N73-30001# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.

THE LOAD NEAR THE APEX OF A LIFTING SWEPT WING IN LINEARISED SUBSONIC FLOW

Patricia J. Davies London Aeron. Res. Council 1972 32 p refs Supersedes RAE-TR-72031; ARC-33584
(ARC-R/M-3716; RAE-TR-72031; ARC-33584) Avail: NTIS HC $3.75; HMSO £1.20; PHI $4.90

Recent work on subsonic lifting-surface theory for wings with pointed apices has shown that representing both the singularity in the load at the apex and the detailed behavior of the load near the apex leads to large increases in the accuracy of collocation methods. The strength of the singularity has been found in earlier calculations as a function of the apex angle of the wing. These calculations are extended here to include the nonsingular factor in the load, which also depends on the apex angle. Interpolation formulae are obtained, which provide an accurate closed-form approximation to the behavior of the load distribution near the apex for all apex angles. Author (ESRO)

N73-30002# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.

AN EXACT TEST CASE FOR THE PLANE POTENTIAL FLOW ABOUT TWO ADJACENT LIFTING AEROFOILS

B. R. Williams London Aeron. Res. Council 1973 38 p refs Supersedes RAE-TR-71197; ARC-33661
(ARC-R/M-3717; RAE-TR-71197; ARC-33661) Avail: NTIS HC $4.00; HMSO £1.40; PHI $5.80

A method for calculating the incompressible potential flow about two particular airfoil sections is presented. The potential flow about two lifting circles is calculated by the method of images, and the two circles are mapped conformally onto two airfoils by a double application of the Karman-Trefftz transformation. The results for the test cases are then compared with those from a numerical method, which uses a surface distribution of sources. Author (ESRO)

N73-30003# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.

AN ANALYSIS OF THE DRAG OF TWO ANNULAR AEROFOILS

C. Young London Aeron. Res. Council 1973 61 p refs Supersedes RAE-TR-71126; ARC-33662
(ARC-R/M-2718; RAE-TR-71126; ARC-33662) Avail: NTIS HC $5.25; HMSO £2.25; PHI $8.80

An analysis of the drag and pressure measurements made in subsonic wind tunnel tests on two annular airfoils is described. The relation between the design pressure distribution in incompressible flow and the pressure distribution on the airfoil at high speed, is discussed. An attempt has also been made to see what changes in the flow field are associated with the drag-rise and whether the drag-rise Mach number can be predicted by methods similar to those used for ordinary airfoils and bodies of revolution. A comparison has been made of the measurements on a two-dimensional aerofoil and the annular aerofoils; no significant differences in the structure of local regions of supersonic flow were found at Mach numbers near the drag-rise.
Author (ESRO)

N73-30004# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.

AN ITERATIVE METHOD FOR CALCULATION OF THE LOADING ON A THIN UNSWEPT WING

C. C. L. Sells London Aeron. Res. Council 1973 33 p refs Supersedes RAE-TR-72009; ARC-33585
(ARC-R/M-3719; RAE-TR-72009; ARC-33585) Avail: NTIS HC $3.75; HMSO £1.35; PHI $5.30

A pilot method has been developed, and an EMA computer program written, for the iterative calculation of the load distribution on a thin wing with prescribed warp (downwash). At each iteration the downwash due to the current loading iterate is computed and loading corrections are calculated from the downwash difference field until this is sufficiently small. The method has been applied to two rectangular wings of aspect ratio 6, one a flat plate, the other with parabolic camber, and except for a small region near the tip leading edge, has been found to converge quickly, 3 iterations being sufficient to obtain overall accuracy better than 1% in both cases. The method awaits extension to deal with a swept wing. Author (ESRO)

N73-30005# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.

AN EXPERIMENTAL INVESTIGATION OF THE SUBSONIC LONGITUDINAL CHARACTERISTICS OF FIVE SLENDER-WING MODELS WITH GOTHIC PLANFORMS

D. L. I. Kirkpatrick and D. A. Kirby London Aeron. Res. Council 1973 48 p refs Supersedes RAE-TR-71137; ARC-33473
(ARC-R/M-3720; RAE-TR-71137; ARC-33473) Avail: NTIS HC $4.50; HMSO £1.75; PHI $6.75

The lift drag and pitching moment on five symmetrical slender-wing models with sharp edges and aspect ratios of 1.28 and 1.46 have been measured at low subsonic speed. Four of the models had a gothic planform and one a mild gothic planform. Variations in thickness distributions were covered by the range of models and the tests included a modification of one of the

models to reduce the lift-dependent drag. These tests extended, earlier work on slender wings to higher aspect ratios and the results have been analysed to show how the lift, drag and longitudinal stability of wings in this higher range of aspect ratio are affected by planform shape and the chordwise and spanwise distribution of wing thickness. Author (ESRO)

N73-30006# Saab-Scania, Linkoping (Sweden). Aerospace Div.
APPLICATON OF THE POLAR COORDINATE METHOD TO OSCILLATING WING CONFIGURATIONS
Valter J. E. Stark Mar. 1973 45 p refs
(SAAB-L-0-R64) Avail: NTIS HC $4.25

The Polar Coordinate Method (PCM), previously applied to oscillating finite wings with control surfaces in subsonic flow, has been generalized and programmed in FORTRAN for the CDC 6600 computer. The program, called SALOWC 3 (Aerodynamic Loads on Oscillating Wing Configurations), based on the assumption that the configuration may be idealized as a combination of planar, trapezoidal surfaces (up to 10), was applied to various wing configurations such as AGARD, Cornell, Laschka-Schmid, Stark T-tail, fin with rudder, and F-14-like configuration. In the majority of cases the results are in good agreement with corresponding results obtained by kernel function and the Doublet Lattice Methods. The program has proved more economical than a previous program based on the Lifting Line Element method. ESRO

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N73-30007# Aeronautical Research Labs., Melbourne (Australia).
REVIEW OF SONIC BOOM
N. W. Page and A. S. Kaye Feb. 1973 63 p refs Supersedes ARL/A-TM-254
(ARL/A-Note-337; ARL/A-TM-254) Avail: NTIS HC $5.25

A review of current knowledge on sonic boom generation and propagation is presented. The effects of the sonic boom on structures, people, and animals are discussed. Measurements of the effect of sonic booms on structures indicate that, under most conditions, only superficial damage is caused. The effect of the sonic boom on people and animals is a startle response with no direct injury resulting. Author

N73-30008# Federal Aviation Administration, Washington, D.C. Aircraft and Noise Abatement Div.
ENGINEERING AND DEVELOPMENT PROGRAM PLAN: AIRCRAFT SAFETY Program Plan as of Apr. 1973
Apr. 1973 44 p refs
(FAA-ED-18-1) Avail: NTIS HC $4.25

The objectives, scope of work, and funding requirements for a research project in aircraft safety improvement during the 1973 to 1982 time period are discussed. The subjects covered are: (1) fire safety, (2) general aviation aircraft safety, (3) transport safety, (4) quiet short haul air transport, and (5) aviation security. Author

N73-30009*# Boeing Vertol Co., Philadelphia, Pa.
V/STOL TILT ROTOR AIRCRAFT STUDY. VOLUME 5: DEFINITION OF STOWED ROTOR RESEARCH AIRCRAFT
Virgil A. Soule Mar. 1973 134 p refs Sponsored in part by Army
(Contract NAS2-6598)
(NASA-CR-114598; D222-10060-1-Vol-5) Avail: NTIS HC $8.75 CSCL 01C

The results of a study of folding tilt rotor (stowed rotor) aircraft are presented. The effects of design cruise speed on the gross weight of a conceptual design stowed rotor aircraft are shown and a comparison is made with a conventional (non-folding) tilt rotor aircraft. A flight research stowed rotor design is presented. The program plans, including costs and schedules, are shown for the research aircraft development and a wind tunnel plan is presented for a full scale test of the aircraft. Author

N73-30010*# Boeing Vertol Co., Philadelphia, Pa.
V/STOL TILT ROTOR AIRCRAFT STUDY. VOLUME 6: PRELIMINARY DESIGN OF A COMPOSITE WING FOR TILT ROTOR RESEARCH AIRCRAFT
Virgil A. Soule and Y. Badri-Nath Mar. 1973 126 p refs Sponsored in part by Army
(Contract NAS2-6598)
(NASA-CR-114599; D222-10060-2-Vol-6) Avail: NTIS HC $8.50 CSCL 01C

The results of a study of the use of composite materials in the wing of a tilt rotor aircraft are presented. An all-metal tilt rotor aircraft was first defined to provide a basis for comparing composite with metal structure. A configuration study was then done in which the wing of the metal aircraft was replaced with composite wings of varying chord and thickness ratio. The results of this study defined the design and performance benefits obtainable with composite materials. Based on these results the aircraft was resized with a composite wing to extend the weight savings to other parts of the aircraft. A wing design was then selected for detailed structural analysis. A development plan including costs and schedules to develop this wing and incorporate it into a proposed flight research tilt rotor vehicle has been devised. Author

N73-30011*# Boeing Vertol Co., Philadelphia, Pa.
V/STOL TILT ROTOR AIRCRAFT STUDY. VOLUME 7: TILT ROTOR FLIGHT CONTROL PROGRAM FEEDBACK STUDIES
H. R. Alexander, W. Eason, K. Gillmore, J. Morris, and R. Spittle Mar. 1973 364 p refs Sponsored in part by Army
(Contract NAS2-6598)
(NASA-CR-114600; D222-10060-3-Vol-7) Avail: NTIS HC $20.25 CSCL 01C

An exploratory study has been made of the use of feedback control in tilt rotor aircraft. This has included the use of swashplate cyclic and collective controls and direct lift control. Various sensor and feedback systems are evaluated in relation to blade loads alleviation, improvement in flying qualities, and modal suppression. Recommendations are made regarding additional analytical and wind tunnel investigations and development of feedback systems in the full scale flight vehicle. Estimated costs and schedules are given. Author

N73-30012*# Boeing Vertol Co., Philadelphia, Pa.
V/STOL TILT ROTOR AIRCRAFT STUDY. VOLUME 9: PILOTED SIMULATOR EVALUATION OF THE BOEING VERTOL MODEL 222 TILT ROTOR AIRCRAFT
H. Rosenstein, M. A. McVeigh, and P. A. Mollenkof Feb. 1973 92 p refs Sponsored in part by Army
(Contract NAS2-6598)
(NASA-CR-114602; D222-10052-1-Vol-9) Avail: NTIS HC $6.75 CSCL 01C

The results of a real time piloted simulation to investigate the handling qualities and performance of a tilting rotor aircraft design are presented. The aerodynamic configuration of the aircraft is described. The procedures for conducting the simulator evaluation are reported. Pilot comments of the aircraft handling qualities under various simulated flight conditions are included. The time histories of selected pilot maneuvers are shown. Author

N73-30013*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXPERIMENTAL AND ANALYTICAL DETERMINATION OF STABILITY PARAMETERS FOR A BALLOON TETHERED IN A WIND
L. Tracy Redd, Robert M. Bennett, and Samuel R. Bland Washington Sep. 1973 57 p refs
(NASA-TN-D-7222; L-8524) Avail: NTIS HC $3.50 CSCL 01B

Experimental and analytical techniques for determining

stability parameters for a balloon tethered in a steady wind are described. These techniques are applied to a particular 7.64-meter-long balloon, and the results are presented. The stability parameters of interest appear as coefficients in linearized stability equations and are derived from the various forces and moments acting on the balloon. In several cases the results from the experimental and analytical techniques are compared and suggestions are given as to which techniques are the most practical means of determining values for the stability parameters.

Author

N73-30014*# University of Technology, Leicester (England).
SOURCE MECHANISMS FOR ROTOR NOISE RADIATION Interim Report
M. V. Lowson, A. R. Whatmore, and C. E. Whitfield Washington NASA Aug. 1973 61 p refs
(Grant NGR-52-140-002)
(NASA-CR-2077; TT-7202) Avail: NTIS HC $3.50 CSCL 20A

Source mechanisms for subsonic rotor noise radiation have been investigated both theoretically and via a series of experiments on a low speed open rotor mounted in an anechoic chamber. Basic theoretical models for both discrete frequency and broad band noise generation are directly verified by the present experiments. The experiments have also demonstrated the potential significance of a new source of noise associated with the tips. This source appears to govern the high frequency portion of the radiated rotor noise spectrum and could be particularly important at lower speeds for large rotors. The source can be controlled by tip shape modifications. More detailed investigation of these phenomena will be performed during the coming year. Author

N73-30015*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ACOUSTIC INVESTIGATION OF THE ENGINE-OVER-THE-WING CONCEPT USING A D-SHAPED NOZZLE
Meyer Reshotko and Robert Friedman 1973 18 p refs Proposed for presentation at Aero-Acoustic Specialists Conf., Seattle, Wash., 15-17 Oct. 1973; sponsored by AIAA
(NASA-TM-X-71419) Avail: NTIS HC $3.00 CSCL 20A

Small-model experiments were conducted of the engine-over-the-wing concept using a D-shaped nozzle in order to determine the static-lift and acoustic characteristics at two wing-flap positions. Configurations were tested with the flow attached and unattached to the upper surface of the flaps. Attachment was obtained with a nozzle flow deflector. In both cases, high frequency noise shielding by the wing was obtained. Configurations using the D-shaped nozzle are compared with corresponding ones using a circular nozzle. With flow attached to the flaps, the static lift and acoustic results are almost the same for both nozzles. Without the nozzle flow deflector, (unattached flap flow), the D-nozzle is considerably noisier than a circular nozzle in the low and middle frequencies. Author

N73-30016*# Boeing Commercial Airplane Co., Seattle, Wash.
THE DEVELOPMENT OF AN AUGMENTOR WING JET STOL RESEARCH AIRPLANE (MODIFIED C-8A). VOLUME 1: SUMMARY
R. H. Ashleman and H. Kavdahl Aug. 1972 182 p refs 2 Vol.
(Contract NAS2-6025)
(NASA-CR-114503; D6-40720-1-Vol-1) Avail: NTIS HC $11.25 CSCL 01C

A project to develop an experimental aircraft for use as an inflight demonstrator of the augmentor wing, short takeoff concept is discussed. The required modifications were made on a de Havilland C-8A aircraft. The modifications to the aircraft are explained and the performance of the modified aircraft is reported. Author

N73-30017*# Boeing Commercial Airplane Co., Seattle, Wash.
THE DEVELOPMENT OF AN AUGMENTOR WING JET STOL RESEARCH AIRCRAFT (MODIFIED C-8A). VOLUME 2: ANALYSIS OF CONTRACTOR'S FLIGHT TEST
H. Skavdahl and D. H. Patterson Aug. 1972 206 p
(Contract NAS2-6025)
(NASA-CR-114504; D6-40720-2-Vol-2) Avail: NTIS HC $12.50 CSCL 01C

The initial flight test phase of the modified C-8A airplane was conducted. The primary objective of the testing was to establish the basic airworthiness of the research vehicle. This included verification of the structural design and evaluation of the aircraft's systems. Only a minimum amount of performance testing was scheduled; this has been used to provide a preliminary indication of the airplane's performance and flight characteristics for future flight planning. The testing included flutter and loads investigations up to the maximum design speed. The operational characteristics of all systems were assessed including hydraulics, environmental control system, air ducts, the vectoring conical nozzles, and the stability augmentation system (SAS). Approaches to stall were made at three primary flap settings: up, 30 deg and 65 deg, but full stalls were not scheduled. Minimum control speeds and maneuver margins were checked. All takeoffs and landings were conventional, and STOL performance was not scheduled during this phase of the evaluation. Author

N73-30018*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SINGLE WING SUPERSONIC AIRCRAFT Patent Application
Robert T. Jones, inventor (to NASA) Filed 5 Jan. 1973 39 p
(NASA-Case-ARC-10470-2; US-Patent-Appl-SN-321180) Avail: NTIS HC $4.00 CSCL 01C

An aircraft is described with a single fuselage having a main wing and a horizontal stabilizer airfoil pivotally attached at their centers to the fuselage. The pivotal attachments allow the airfoils to be yawed relative to the fuselage for high speed flight, and to be positioned at right angles with respect to the fuselage during take-off, landing, and low speed flight. The main wing and the horizontal stabilizer are upwardly curved from their center pivotal connections towards their ends to form curvilinear dihedrals. NASA

N73-30019*# Techtran Corp., Silver Spring, Md.
METHODS AND TECHNIQUES OF AIRFRAME STRENGTH FLIGHT TESTS
A. I. Gudkov and P. S. Leshakov Washington NASA Aug. 1973 224 p refs Transl. into ENGLISH of the book "Metody i Tekhnika Letnykh Ispytaniy Samoletov na Prochnost' Moscow, Mashinostr., 1972 p 1-248
(Contract NASw-2485)
(NASA-TT-F-769) Avail: NTIS HC $5.50 CSCL 01C

Methods of flight tests for evaluating the strength of airplanes and helicopters are presented. The basic types of modern measurement equipment used for measuring vibrations, stresses, temperatures and other parameters are described and recommendations are given concerning the preparation and calibration of the equipment. Brief information on laboratory airframe tests is included. Methods of flight tests for strength in which loads and vibrations are measured are discussed. Methods of analyzing measurement data in terms of airframe load features are presented. The basic computer hardware used for processing and analyzing measurement results are described. Author

N73-30020*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECT OF WING ASPECT RATIO AND FLAP SPAN ON AERODYNAMIC CHARACTERISTICS OF AN EXTERNALLY BLOWN JET-FLAP STOL MODEL
Charles C. Smith, Jr. Washington Aug. 1973 137 p refs
(NASA-TN-D-7205; L-8752) Avail: NTIS HC $4.50 CSCL 01A

An investigation has been conducted to determine the effects of flap span and wing aspect ratio on the static longitudinal aerodynamic characteristics and chordwise and spanwise pressure distributions on the wing and trailing-edge flap of a straight-wing STOL model having an externally blown jet flap without vertical and horizontal tail surfaces. The force tests were made over an angle-of-attack range for several thrust coefficients and two flap deflections. The pressure data are presented as tabulated and plotted chordwise pressure-distribution coefficients for angles of attack of 1 and 16. Pressure-distribution measurements were made at several spanwise stations. Author

N73-30021*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
WIND TUNNEL INVESTIGATION OF EFFECTS OF VARIATIONS IN REYNOLDS NUMBER AND LEADING-EDGE TREATMENT ON THE AERODYNAMIC CHARACTERISTICS OF AN EXTERNALLY BLOWN JET-FLAP CONFIGURATION
Lysle P. Parlett, Charles C. Smith, Jr., and James L. Megrail (Army Air Mobility R and D Lab., Hampton Va.) Washington Aug. 1973 155 p refs Prepared in cooperation with Army Air Mobility R and D lab., Hampton, Va.
(NASA-TN-D-7194; L-8745) Avail: NTIS HC $4.75 CSCL 01A

An investigation has been conducted in a full-scale tunnel to determine the effects of variations in Reynolds number and leading-edge treatment on the aerodynamic characteristics of an externally blown jet-flap transport configuration. The model had a double-slotted trailing-edge flap and was powered by four high-bypass-ratio turbofan engines. Tests were performed by using each of three leading-edge devices (a 30-percent-chord flap and 15- and 25-percent-chord slats) at Reynolds numbers from 0.47 x one million to 1.36 x one million thrust coefficients up to 3.5. The use of a 25-percent-chord slat was found to be more effective than a 15-percent-chord slat or a 30-percent-chord flap in extending the stall angle of attack and in minimizing the loss of lift after the stall. The large slat was also effective in reducing the rolling moments that occurred when the engine-out wing stalled first. Author

N73-30022# Federal Aviation Administration, Washington, D.C. Office of Systems Engineering Management.
ENGINEERING AND DEVELOPMENT PROGRAM PLAN: AIRCRAFT NOISE AND SONIC BOOM Program Plan
Jun. 1973 38 p
(FAA-ED-20-2) Avail: NTIS HC $4.00

A program plan is designed to provide a data base, from which to develop rule making, for control and abatement of aircraft noise and sonic boom. The primary objectives are to minimize the environmental impact of sonic boom and aircraft generated noise and to develop prediction, reduction, and certification criteria for all categories of aircraft. Development activities currently in progress and programs planned for a period of the next five years are described. Author

N73-30023*# Loughborough Univ. of Technology (England). Dept. of Transport Technology.
SOME EFFECTS OF GROUND AND SIDE PLANES ON THE ACOUSTIC OUTPUT OF A ROTOR
A. R. Whatmore and M. V. Lowson Jul. 1973 28 p refs Sponsored in part by Natl. Gas Turbine Establishment
(Grant NGR-52-140-002)
(NASA-CR-132306; TT-73-R-07) Avail: NTIS HC $3.50 CSCL 20A

Fan Noise levels have been measured for a fan in the proximity of a side and ground plane. The side plane is found to produce substantial increases in noise in the lower harmonics, up to 10 db for the fundamental. The results suggest that fuselage/propeller separations should be greater than about 0.25 dia to minimize interaction noise. The ground plane is found to increase fan noise output up to a separation of one diameter, but to reduce noise at the closest separations. The effects are particularly confined to the harmonics which entirely disappear at the close separations. Under these conditions thrust increases, by over 70% in one case. The effects appear to be due to an improvement in the aerodynamic input to the rotor at small ground plane separations. Author

N73-30024# Boeing Co., Seattle, Wash. Commercial Airplane Group.
A STATUS REPORT ON JET NOISE SUPPRESSION AS SEEN BY AN AIRCRAFT MANUFACTURER
Walter C. Swan and Craig D. Simcox 1972 42 p refs Presented at 1st Intern. Symp. on Air Breathing Engines, Marseille, 19-22 Jun. 1972 Sponsored by Aeron. and Astronaut. Assoc. of France and Soc. of Mech. Engr. of France
Avail: NTIS HC $4.25 CSCL 20A

The activities of an aircraft company on the reduction of jet efflux noise for three major applications of commercial aircraft are discussed. The SST noise problem is discussed. Activities on the use of chutes, spades, and tubes in combination with C-D and plug nozzles are outlined. Comparisons of noise suppression and thrust loss, and how these data support the compatibility of an SST with the community are shown. The conventional subsonic jet noise problem is reviewed in the light of current and proposed noise regulations. A discussion of recent test experience and an estimate of the apparent jet noise floor which can be economically accepted is made. The jet noise problem for future STOL or short haul aircraft is discussed and the apparent lack of agreement on noise data in the low velocity, 300 - 800 ft/sec range is reported. Author

N73-30025# National Aviation Facilities Experimental Center, Atlantic City, N.J.
SIMULATED GROUND LEVEL STOL RUNWAY/AIRCRAFT EVALUATION Final Report, Jul. 1970 - Jul. 1972
Roman M. Spangler, Jr. Sep. 1973 172 p
(FAA-NA-72-77; FAA-RD-73-110) Avail: NTIS HC $10.75 CSCL 01C

A De Havilland DHC-6, Series 100 Twin Otter was flown by a representative group of pilots on various steep-gradient approaches onto a ground-level STOL runway. Approximately 800 approaches and landings were accomplished to provide a data base to approve a first-generation STOL operation. Areas investigated included: (1) aircraft handling and response on steep-gradient approaches with various approach electronic beam sensitivities; (2) location of the ground point of intercept; (3) co-located versus split localizer/glide slope signal source; (4) obstacle clearance requirements; (5) field length requirements; and (6) influence of command-steering on aircraft/pilot performance. Author 2

N73-30026*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AIRPORT-AREA AIRSPACE USED IN SIMULATED OPERATIONS WITH AN EXPERIMENTAL POWERED-LIFT STOL AIRPLANE
Norman S. Silsby and Richard H. Sawyer Washington Sep. 1973 29 p refs
(NASA-TN-D-7300; L-8869) Avail: NTIS HC $3.00 CSCL 01C

Simulation tests were made using an experimental powered-lift STOL airplane to help define airport-area airspace requirements for STOL operations. The operational feasibility and airspace used in take-offs followed by climbing turns, offset (bent localizer) approaches, missed approaches, and two-segment (bent glide-slope) approaches were studied. Flight-director guidance was provided for the approach maneuvers. Author

N73-30027*# Kanner (Leo) Associates, Redwood City, Calif.
ON THE PITCH DAMPING MOMENT IN HOVERING OF A RIGID HELICOPTER ROTOR
K. Takasawa Washington NASA Sep. 1973 143 p refs Transl. into ENGLISH from Kogyo Gijutsuin, Hakko Kenkyusho Kenkyu Hokoku (Tokyo), NAL TR-256, Nov. 1971 80 p
(Contract NASw-2481)
(NASA-TT-F-15010; NAL-TR-256) Avail: NTIS HC $9.25 CSCL 01C

The aerodynamic damping moment in pitch was measured with a hovering helicopter rotor. Three kinds of model blades with different rigidity were tried. A flow visualization study was performed for the purpose of determining the relative position between the blade and the vortices in steady hovering state. The perfectly rigid rotor was determined. Aerodynamic damping moment in pitch was analyzed. A quasi-steady theory is devised. A simple formula for calculating the pitch damping derivative of a helicopter rotor with spring constrained flapping hinge is proposed. The validity of the formula is ascertained by comparison with experimental results. Author

N73-30028*# Kanner (Leo) Associates, Redwood City, Calif.
METEOROLOGICAL SAFETY OF AIRCRAFT FLIGHTS
K. Yankin Washington NASA Sep. 1973 13 p Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 5, 1973 p 12-13
(Contract NASw-2481)
(NASA-TT-F-15069) Avail: NTIS HC $3.00 CSCL 01B

The instruction on meteorological safety of civil aviation,

coming into effect at the end of 1973 is presented. Authorized means and frequencies of meteorological and aerological observations of cloud bottom heights, visibility and wind, the collection and distribution of actual weather, types of weather forecasts, composition and itemization of forecasts, evaluation of forecasts, meteorological documentation and preflight meteorological briefings are discussed. Meteorological documentation given to crews of supersonic transport aircraft is included. Author

N73-30029# Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, Paris (France).
STUDIES OF THE INFLUENCE OF DENSITY ON JET NOISE
R. G. Hoch, J. P. Duponchel, B. J. Cocking (Natl. Gas Turbine Estab., Pyestock, Engl.), and W. D. Bryce (Natl. Gas Turbine Estab., Pyestock, Engl.) 1972 36 p refs Presented at the 1st Intern. Symp. on Air Breathing Engines, Marseille, 19-23 Jun. 1972
Avail: NTIS HC $4.00 CSCL 20A

Studies of exhaust noise from turbofan or turbojet engines at low thrust have emphasized the lack of consistency of jet noise prediction methods, particularly at low exhaust velocities. This situation has arisen mainly from difficulties with engine noise analysis and from the presence of rig noise in many model test facilities. These problems have masked the true effect of density on jet noise. Two independent research programs on model jets have been developed using advanced research facilities to study the effect of density by varying the jet temperature, at velocities from 150 to 800 m/s. Data for the sound power and peak noise levels are presented together with a range of spectra and directivity patterns. A principal result of these studies is that, while at high jet velocities the jet noise decreases with decreasing density, at low velocities the trend is reversed. It is shown that the noise data can be normalized using a velocity-dependent function of the jet density. Author

N73-30030# Dowty Rotol Ltd., Gloucester (England).
THE VARIABLE PITCH FAN - PROPULSION FOR QUIET STOL
D. G. M. Davis [1972] 30 p refs Presented at 1st Intern. Symp. on Air Breathing Engines, Marseille, France, 19-23 Jun. 1972
Avail: NTIS

The use of variable pitch fan propulsion for quiet short takeoff aircraft is discussed. The basic feasibility of using a fully variable pitch fan driven by a turboshaft engine has been investigated. The aerodynamic and acoustic testing of different blade designs over the complete pitch range using a compressor test rig has been conducted. The refinement of the mechanical design aspects with consideration of different applications is reported. Author

N73-30031*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
RESULTS OF THE NOISE MEASUREMENT PROGRAM ON A STANDARD AND MODIFIED OH-6A HELICOPTER
Herbert R. Henderson, Robert J. Peegg, and David A. Hilton Washington Sep. 1973 105 p refs
(NASA-TN-D-7216; L-8129) Avail: NTIS HC $4.25 CSCL 20A

A field noise measurement program has been conducted on a standard OH-6A helicopter and one that had been modified by reducing the rotor speed, altering rotor tip shape, and treating the engine exhaust and inlet to reduce the external noise levels. The modifications consisted of extensive aircraft design changes resulting in substantial noise reductions following state-of-art noise reduction techniques. The purpose of this study was to document the ground noise characteristics of each helicopter during flyover, hover, landing, and take-off operations. Based on an analysis of the measured results, the average of the overall on-track noise levels of the final modified helicopter was approximately 14 db lower than that for the standard helicopter. Narrow-band-spectra data of the hovering helicopter show a reduction in the overall noise due to the reductions achieved for the lifting main and antitorque tail rotor, engine exhaust, and gear box noise for the modified helicopter. The noise results of the test program are found to correlate generally with noise measurements made previously on this type of aircraft. Author

N73-30032*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LANDING PERFORMANCE OF AN AIR CUSHION LANDING SYSTEM INSTALLED ON A 1/10-SCALE DYNAMIC MODEL ON THE C-8 BUFFALO AIRPLANE
William C. Thompson Washington Sep. 1973 27 p refs
(NASA-TN-D-7295; L-8724) Avail: NTIS HC $3.00 CSCL 01C

An experimental study was conducted to evaluate the landing behavior of a 1/10-scale dynamic model of the C-8 Buffalo airplane equipped with an air-cushion landing system (ACLS) on a variety of surfaces including both calm and rough water and a smooth hard surface. Taxi runs were made on the hard surface over several obstacles. Landings were made with the model at various pitch and roll attitudes and vertical velocities and at one nominal horizontal velocity. Data from the landings include time histories of the trunk and air-cushion pressures and accelerations at selected locations on the model. Author

N73-30033*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FULL-SCALE WIND-TUNNEL INVESTIGATION OF EFFECTS OF SLOT SPOILERS ON THE AERODYNAMIC CHARACTERISTICS OF A LIGHT TWIN-ENGINE AIRPLANE
Harry A. Verstynen, Jr. and Dominick Andrisani, II Washington Sep. 1973 34 p refs
(NASA-TN-D-7315; L-8865) Avail: NTIS HC $3.00 CSCL 01C

A wind-tunnel investigation has been conducted to determine the effects of slot spoilers on the longitudinal and lateral aerodynamic characteristics of a full-scale mockup of a light twin-engine airplane. The slots were located along the leading edge of the flaps and were used to modulate the flap-induced lift as a possible means of achieving direct lift control. The data showed that the slots were effective in spoiling up to 61 percent of the flap-induced lift, but that an adverse pitching-moment change (nose up) accompanied opening the slots. Opening the slots was found to decrease slightly the downwash angle at the tail and to increase slightly the longitudinal stability of the model. Author

N73-30034# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Instrumentierung und Anthropotechnik.
TACHISTOSCOPIC INVESTIGATIONS ON ELECTRONIC AND CONVENTIONAL COCKPIT DISPLAYS [TACHISTOSKOPISCHE UNTERSUCHUNGEN AN ELEKTRONISCHEN UND KONVENTIONELLEN ANZEIGEN FUER DIE FLUGFUEHRUNG]
Wolfgang Heinze 1973 56 p refs In GERMAN; ENGLISH summary Sponsored by Deut. Forschungsgemeinschaft Prepared jointly with Tech. Univ. Brunswick
(DLR-FB-73-27) Avail: NTIS HC $5.00; DFVLR, Porz, West Ger. 13.50 DM

In connection with investigations on the possibility of application of electronically produced data representations to guidance and control, a comparison of electromechanical and electronic indicating instruments was carried out using a tachistoscope. The results showed significantly better identification performances measured in the case of the electronic display than in the case of using corresponding, conventional indicator instruments. It could be proved that confusions are probable when employing the usual symbology for horizon and horizontal bar flight director display. For the ILS and flight director displays, respectively, interesting indicators resulted for future display designs. Author (ESRO)

N73-30035# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Aeroelastik.
DYNAMIC AND AEROELASTIC PROBLEMS OF STOP-ROTORS AND THEIR ANALYTICAL TREATMENT. PART 2: DETAILS OF ANALYTICAL SOLUTION [DYNAMISCHE UND AEROELASTISCHE PROBLEME DES STOP-ROTORS UND IHRE ANALYTISCHE BEHANDLUNG. TEIL 2: ANALYTISCHE ANSAETZE UND LOESUNGSVERFAHREN]
H. Foersching 17 Jan. 1973 82 p refs In GERMAN; ENGLISH summary

(DLR-FB-73-19; AVA-FB-7229) Avail: NTIS HC $6.25; DFVLR, Porz, West Ger. 17,40 DM

Based upon the analytical relations derived in Part I the details of the analytical solutions of dynamic and aeroelastic problems of stop-rotors of V/STOL-aircraft, occuring during blade folding and retracting, are presented. In particular, the problems of static aeroelastic torsional stability, the flutter behavior and the dynamic response of a stopped rotor blade to a discrete gust are treated. The investigations are completed by some typical computation examples. For part 1 see N73-18027.

Author (ESRO)

N73-30036# National Aerospace Lab., Amsterdam (Netherlands).

BEHAVIOR OF VERY LARGE AIRCRAFT DISTURBED BY WIND SHEAR AND ATMOSPHERIC TURBULENCE

W. P. deBoer 10 Feb. 1972 61 p refs

(NLR-TR-72023-U) Avail: NTIS HC $5.25

The behavior of very large aircraft disturbed by wind shear and atmospheric turbulence (vertical gust during the landing approach) is analyzed by means of a multiloop system. The aircraft considered were a B-747-like aircraft and two hypothetical aircraft, the VLAC-1A and The VLAC-4A, with weights ranging from 500,000 to 4,000.000 lbs. A combined system, consisting of an autothrottle to control airspeed and a human pilot model to control altitude, was developed. It was shown that because of the decreasing value of short period value with increasing aircraft weight, a larger value of the lead time constant is needed for the larger aircraft resulting in a worse pilot rating. Results indicated that due to higher approach speeds of the larger aircraft, a higher percentage of the available thrust will be needed to cope with a given wind shear. Increased engine response lag can deteriorate altitude control. ESRO

N73-30037# Royal Netherlands Aircraft Factories Fokker, Amsterdam. Manufacturing Research and Product Development Dept.

ADHESIVE BONDING IN THE FOKKER-VFW F-28 'FELLOWSHIP'

Rob J. Schliekelmann Feb. 1973 15 p

(FOK-K-67) Avail: NTIS HC $3.00

For achievement of the required long fatigue life, suitable failsafe characteristics and high durability, a choice for all-out use of adhesive bonded structures in the Fokker F-28 'fellowship' was made. As a target for the fatigue life 30,000 flying hours or 60,000 flights were specified. The various design aspects of adhesive bonded structures, including bonded sheet laminations, bonded stringers, and sandwich structures are presented. The adhesive bounding processes, as well as the adhesive bonded Fokker F-28 structures, are outlined. Adhesion and cohesion quality methods used to control and develop reliable and reproducible manufacturing processes for all phases of the adhesive bonding production cycle are described. ESRO

N73-30038# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THREE DIMENSIONAL BOUNDARY LAYER IN THE VICINITY OF A CRITICAL LINE OF A SLIPPING WING DURING NONUNIFORM SUCTION

V. A. Barinov 20 Jun. 1973 16 p refs Transl. into ENGLISH from Uch. Zap. Tsagi (USSR), v. 3, no. 1, 1972 p 23-29

(AD-763280; FTD-HR-23-611-73) Avail: NTIS CSCL 01/3

A numerical method is described for calculating the equations of an incompressible boundary layer, which is a generalization of the method of integral relations of A. A. Dorodnitsyn for a three-dimensional boundary layer. Presented are the results for calculating the characteristics of the boundary layer for the various distribution laws of suction intensity on the leading edge along the wing span. GRA

N73-30039# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INCREASING THE RELIABILITY OF GLASSWORK PARTS MADE FROM ORGANIC GLASS UNDER OPERATING CONDITIONS

I. V. Rozhdestvenskii 22 Jun. 1973 9 p Transl. into ENGLISH from Ekspluatatsionnaya Nadezhnost, Kachestvo i Svoistva Samoletnogo Organicheskogo Stekla (USSR), no. 177, 1971 p 25-27

(AD-763263; FTD-HT-23-436-73) Avail: NTIS CSCL 01/3

Studies were made to develop new materials having high physical-mechanical properties and high stability to atmospheric influences and operational loads. GRA

N73-30040# Franklin Inst. Research Labs., Philadelphia, Pa.

SNOW STABILIZATION FOR HELICOPTER LANDINGS Final Report

Edward R. Evans May 1973 37 p refs

(Contract DAAD05-73-C-0170)

(AD-763231; FIRL-F-3549-01; LWL-CR-01C73) Avail: NTIS CSCL 01/2

The report describes the procedures for and the results of field tests conducted to stabilize snow by chemical treatment. Sintering of the snow by spraying methanol on its surface suppresses a possible white out condition when helicopters perform normal take-off and landings upon the treated areas. The addition of a violet dye to the methanol also provided the aircraft pilot with a definitive form of reference when the ground was covered with snow and no nearby markers were present.

Author (GRA)

N73-30041# Army Aviation Systems Command, St. Louis, Mo.

MAJOR ITEM SPECIAL STUDY (MISS), CH-47A SYNCHRONIZING DRIVE SHAFT ADAPTER Interim Report, 1 Jan. 1964 - Jul. 1972

Jun. 1973 23 p

(AD-763186; USAAVSCOM-TR-73-11) Avail: NTIS CSCL 13/5

Major Item Special Study (MISS) reports are performed on DA Form 2410 reportable components. These are time change items and certain condition change items selected because of high cost or need for intensive management. Basically, the MISS reports are concerned with analyzing reported removal data presented in the Major Item Removal Frequency (MIRF) report. The failure modes reported for each removal are examined and grouped into categories which are intended to clarify the intent of the data reporting. From this data, removal distributions can be plotted and an MTR (mean time to removal) can be calculated. The MISS reports than investigate possible cost savings based on total elimination of selected failure modes. These modes are chosen because of the percentage of failures they represent and/or because they appear to be feasible Product Improvement Program (PIP) areas. Author (GRA)

N73-30042# Army Aviation Systems Command, St. Louis, Mo.

MAJOR ITEM SPECIAL STUDY (MISS), CH-47A MAIN ROTOR BLADE, FORWARD Interim Report, 1 Jan. 1964 - 1 Jul. 1973

Jul. 1973 23 p Revised

(AD-763187; USAAVSCOM-TR-73-13) Avail: NTIS CSCL 01/3

Major Item Special Study (MISS) reports are performed on DA Form 2410 reportable components. These are time change items and certain condition change items selected because of high cost or need for itensive management. Basically, the MISS reports are concerned with analyzing reported removal data presented in the Major Item Removal Frequency (MIRF) report. The failure modes reported for each removal are examined and grouped into categories which are intended to clarify the intent of the data reporting. From these data, removal distributions can be plotted and an MTR (mean time to removal) can be calculated. The MISS reports then investigates possible cost savings based on total elimination of selected failure modes. These modes are chosen because of the percentage of failures they represent and/or because they appear to be feasible product improvement program (PIP) areas. Author (GRA)

N73-30043# Army Aviation Systems Command, St. Louis, Mo.

MAJOR ITEM SPECIAL STUDY (MISS), OH-58A TAIL ROTOR BLADE Interim Report, 1 Jan. 1964 - 30 Jun. 1972

Jul. 1973 33 p Revised

(AD-763188; USAAVSCOM-TR-73-14) Avail: NTIS CSCL 01/3

For Abstract, see N73-30042.

N73-30044# Boeing Aerospace Co., Seattle, Wash.
INVESTIGATION OF REINFORCED THERMOPLASTICS FOR NAVAL AIRCRAFT STRUCTURAL APPLICATION Final Report, 1 Jun. 1972 - 1 May 1973
John T. Hoggatt Jun. 1973 117 p refs
(Contract N00019-72-C-0526)
(AD-763470; D180-17531-1) Avail: NTIS CSCL 11/4

The report discusses research on reinforced plastics. It was conducted in three phases. Phase I, which constituted the major portion of the effort, concentrated on studying 181 style glass fabric reinforced thermoplastic laminates. Phase II investigated the practicality of using graphite reinforcements rather than glass fabric, and finally, Phase III investigated potential methods of production and the cost impact of this concept on component manufacture. It was demonstrated in the program that reinforced thermoplastic laminates could perform competitively with epoxy glass fabric laminates and result in a potentially lower cost production material. The materials were compared on a basis of mechanical properties, environmental resistance and electrical properties. (Modified author abstract) GRA

N73-30045# Kaman Avidyne, Burlington, Mass.
MASMOD: A PREPROCESSOR PROGRAM FOR PREPARING THE DYNAMIC MODEL FOR VIBRA-4 Final Report
Thomas A. Dalton, Norman P. Hobbs, and Joan M. Coco May 1973 704 p refs
(Contract DNA001-72-C-0111; DNA Proj. NWED-NB-003)
(AD-763701; KA-TR-92; DNA-3050G) Avail: NTIS CSCL 01/3

A digital computer program, MASMOD (Mass Model), which is capable of generating both the mass and aerodynamic aircraft models required for the VIBRA-4 (Vehicle Inelastic Bending Response Analysis) computer program is presented in this report. MASMOD employs basic data given for an aircraft to generate either individual component or entire aircraft lumped-mass and aerodynamic models, three-dimensional influence coefficients, and mode shapes and frequencies. Additionally, MASMOD has the capability of plotting the formulated mass and aerodynamic models as well as the components: relative bending and torsion in each vibrational mode calculated by the program. Author (GRA)

N73-30046# California Univ., Los Angeles. School of Engineering and Applied Science.
IDENTIFICATION OF SYSTEMS SUBJECT TO RANDOM STATE DISTURBANCE
A. V. Balakrishnan Jun. 1973 23 p refs
(Grant AF-AFOSR-2492-73; AF Proj. 9769)
(AD-763741; UCLA-ENG-7348; AFOSR-73-1223TR) Avail: NTIS CSCL 01/3

A theory of identification of a class of linear systems - lumped and distributed - in the presence of state or process noise is presented. As a specific application, the problem of identifying aircraft stability - control derivatives in turbulence is considered, and results obtained on actual flight data are included. Author (GRA)

N73-30047# Army Foreign Science and Technology Center, Charlottesville, Va.
EXPANSION OF THE POTENTIALITIES OF AUTOMATIC FLIGHT CONTROL BY USING ADAPTIVE CONTROL SYSTEMS AND VARIABLE-STRUCTURE CONTROL SYSTEMS
G. I. Avrutskii and L. S. Valkov 8 Mar. 1973 10 p refs
Transl. into ENGLISH from an unidentified Russian monograph
(AD-763415; FSTC-HT-23-1387-72) Avail: NTIS CSCL 01/3

Basic requirements for automatic flight control systems are described in a generalized manner. GRA

N73-30048# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
SURFACE EFFECT TAKE-OFF AND LANDING SYSTEM (SETOLS) SUBSONIC STATIC STABILITY OUT OF GROUND EFFECT
H. Dulany Davidson, Jr. and Lawrence A. Frank Oct. 1972 34 p refs
(ARPA Order 2121)
(AD-763365; Evaluation-AL-97) Avail: NTIS CSCL 01/2

The effect of a deployed air cushion landing gear on the stability of a high performance aircraft was studied at the Naval Ship Research and Development Center's 8 x 10 foot subsonic wind tunnel. Air cushion designs submitted by Bell Aerospace Corporation and Boeing were fitted to a ten percent scale A-4E and air cushions designed by Goodyear (two configurations), San Diego Aircraft Engineering Incorporated (SANDAIRE), and Bell were fitted to a ten percent scale F-8C. The effects of the air cushion landing gear ranged from minor destabilization, to very detrimental destabilization on both aircraft in the landing approach configuration. Author (GRA)

N73-30049# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
AN ELEMENTARY THEORETICAL COMPARISON OF THE AERODYNAMIC CHARACTERISTICS OF JET, BLOWN AND EJECTOR FLAPS
Robert Poplawski May 1973 45 p refs
(AD-763793; ASD/XR-72-25) Avail: NTIS CSCL 01/3

The document aims to provide a basic capability to calculate the aerodynamic performance of jet, blown, and ejector flaps. It avoids complex mathematics and only presents general graphical results that are necessary to perform the elementary theoretical calculations. The graphical data is used to perform some basic comparisons between the jet, blown, and ejector flaps. For the cases considered, the ejector flap was found to provide the best performance. To caution the novice in his use of the theoretical results, some wind tunnel data are presented which appear to contradict the theoretical results. Improper use of the momentum coefficient term and flow separation is noted. (Modified author abstract) GRA

N73-30050# Allied Research Associates, Inc., Newton Upper Falls, Mass.
EXPERIMENTAL INVESTIGATION OF WAKE VELOCITY FLUCTUATIONS BEHIND STALLED WINGS AT REYNOLDS NUMBERS UP TO 4.8 MILLION Final Report, Feb. 1971 - Feb. 1973
Robert F. Smiley Feb. 1973 62 p refs
(Contract N00019-71-C-0360)
(AD-763468; ARA-9G87-F) Avail: NTIS CSCL 01/3

A wind tunnel investigation was made of transient wake velocities behind three stalled wings with NACA 0012 airfoils and spans equal to test section width up to a maximum Reynolds number of 4.8 million. Two wings had constant chords of 6 inches and 3 inches and one was tapered with a root chord of 12 inches and a tip chord of 6 inches. Anemometer time-history data were recorded on tape for angles of attack of 16.2 degrees, 21.1 degrees, 25.8 degrees and 30.3 degrees, and were used to evaluate wake geometry, frequency and mean and perturbation velocities for the constant chord wings. (Modified author abstract) GRA

N73-30051# California Univ., Los Angeles. Dept. of System Sciences.
IDENTIFICATION AND STOCHASTIC CONTROL WITH APPLICATION TO FLIGHT CONTROL IN TURBULENCE
Kenneth W. Liff May 1973 260 p refs
(Grant AF-AFOSR-2492-73; AF Proj. 9769)
(AD-763739; UCLA-eng-7340; AFOSR-73-1138TR) Avail: NTIS CSCL 01/3

The report deals with the problem of adaptive control of an aircraft in atmospheric turbulence. The problem is approached by first identifying the unknown coefficients and then applying optimal control theory to the system so determined. The theory developed is general enough to apply to any linear system with unknown coefficients and state noise. The bulk of the development concerns the identification problem and several methods are studied. In particular, what may be called (stochastic) identification method, taking into account the unknown state noise, is studied for the first time. GRA

N73-30052# McDonnell Aircraft Co., St. Louis, Mo.
SONIC FATIGUE TEST METHODS AT ELEVATED TEMPERATURES Final Report, Mar. 1971 - Dec. 1972
M. H. Hieken, W. E. Noonan, and E. F. Shroyer Jun. 1973

148 p refs
(Contract F33615-71-C-1217; AF Proj. 4437)
(AD-763798; MDC-A1622; AFFDL-TR-73-8) Avail: NTIS CSCL 01/3

Sonic fatigue testing at elevated temperatures has become increasingly important as aerospace vehicle structures are designed for the combined environments. Work is described in four areas related to thermal/acoustic testing: acoustic simulation, thermal simulation, specimen mounting effects, and instrumentation and measurements. Acoustic field studies considered the directional properties of various fields, as well as coupling of the acoustic fields with structural specimens. Thermal environment studies dealt with predicting temperatures in a heated structural specimen. The design of heating systems was also discussed. In specimen mounting effects, equations were presented to show how thermal loads enter into the general dynamic equations. Panels with free edges and panels with fixed edges were treated in detail. Measurement methods related to sonic fatigue testing at elevated temperatures were surveyed for availability of devices which operate in the combined environment. (Modified author abstract) GRA

N73-30053# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
IN-FLIGHT SAFETY OF PASSENGERS AND FLIGHT ATTENDANTS ABOARD AIR CARRIER AIRCRAFT
14 Mar. 1973 41 p refs
(PB-220374/3; NTSB-AAS-73-1) Avail: NTIS HC $3.75 CSCL 01B

The study examines nonfatal in-flight injuries of passengers and flight attendants in air carrier operations during the years 1968 through 1971. Injuries caused by turbulence, evasive maneuvers to avoid a collision, and self-initiated injuries are summarized. Conditions, circumstances, and preexisting factors instrumental in creating a hazardous environment for persons aboard aircraft are examined, as well as types of injuries sustained and the treatment of such injuries. Also examined is the relationship of injuries to passenger seatbelt discipline, structure and design of cabin furnishings, flight attendants, duties, consumption of alcoholic beverages, and the location in the airplane of passengers and flight attendants. Six safety recommendations are presented. Author (GRA)

N73-30054# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
PREDICTION OF V/STOL NOISE FOR APPLICATION TO COMMUNITY NOISE EXPOSURE Final Report, Jun. - Dec. 1972
Charles L. Munch May 1973 280 p refs
(Contracts DOT-TSC-438; DOT-OS-207)
(PB-221140/7; DOT-TSC-OST-73-19) Avail: NTIS HC $6.75 CSCL 20A

A computer program to predict the effective perceived noise level (EPNL), the tone corrected perceived noise level (PNLT), and the A-weighted sound level (dBA) radiated by a V/STOL vehicle as it flies along a prescribed takeoff, landing, or cruise flight path is described and a complete users guide for the program is presented. The procedures used to predict the noise radiated by helicopter rotors, propellers, turboshaft engines, lift and cruise fans, and jets are described in detail. Helicopter rotor noise and jet noise are theoretically predicted with some empirical modifications while propeller, fan, and turboshaft engine noise is calculated with primarily empirical procedures. Author (GRA)

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines, hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; Nuclear Engineering; and 28 Propulsion Systems.

N73-30055*# TRW Systems Group, Redondo Beach, Calif.
SOLAR CELL RADIATION HANDBOOK Final Report
J. R. Carter, Jr. and H. Y. Tada 28 Jun. 1973 232 p refs
Prepared for JPL
(Contracts NAS7-100; JPL-953362)
(NASA-CR-133738; TRW-21945-6001-RU-00) Avail: NTIS HC $13.75 CSCL 10A

A method is presented for predicting the degradation of a solar array in a space radiation environment. Solar cell technology which emphasizes the cell parameters that degrade in a radiation environment, is discussed along with the experimental techniques used in the evaluation of radiation effects. Other topics discussed include: theoretical aspects of radiation damage, methods for developing relative damage coefficients, nature of the space radiation environment, method of calculating equivalent fluence from electron and proton energy spectrums and relative damage coefficients, and comparison of flight data with estimated degradation. F.O.S.

N73-30056*# Pratt and Whitney Aircraft, East Hartford, Conn.
FUEL CELL TECHNOLOGY PROGRAM Final Report
25 Jul. 1973 66 p
(Contract NAS9-11034)
(NASA-CR-134002; PWA-4756) Avail: NTIS HC $5.50 CSCL 10A

A fuel cell technology program was established to advance the state-of-the-art of hydrogen-oxygen fuel cells using low temperature, potassium hydroxide electrolyte technology as the base. Program tasks are described consisting of baseline cell design and stack testing, hydrogen pump design and testing, and DM-2 powerplant testing and technology extension efforts. A baseline cell configuration capable of a minimum of 2000 hours of life was defined. A 6-cell prototype stack, incorporating most of the scheme cell features, was tested for a total of 10,497 hours. A 6-cell stack incorporating all of the design features was tested. The DM-2 powerplant with a 34 cell stack, an accessory section packaged in the basic configuration anticipated for the space shuttle powerplant and a powerplant control unit, was defined, assembled, and tested. Cells were used in the stack and a drag-type hydrogen pump was installed in the accessory section. A test program was established, in conjunction with NASA/JSC, based on space shuttle orbiter mission. A 2000-hour minimum endurance test and a 5000-hour goal were set and the test started on August 8, 1972. The 2000-hour milestone was completed on November 3, 1972. On 13 March 1973, at the end of the thirty-first simulated seven-day mission and 5072 load hours, the test was concluded, all goals having been met. At this time, the DM-2 was in excellent condition and capable of additional endurance. Author

N73-30057*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
SPACE STATION SOLAR ARRAY TECHNOLOGY EVALUATION PROGRAM Final Report
F. V. Bischof Feb. 1973 138 p
(Contract NAS9-11039)
(MSC-07163) Avail: NTIS HC $9.00 CSCL 10A

The results of all the major program phases of the program are reported. All goals of the program, which are listed were successfully accomplished and are briefly described. A complete list is included of all drawings generated during this program. Author

N73-30058# Argonne National Lab., Ill.
LITHIUM/SULFUR BATTERIES FOR OFF-PEAK ENERGY STORAGE: A PRELIMINARY COMPARISON OF ENERGY STORAGE AND PEAK POWER GENERATION SYSTEMS
M. L. Kyle, E. J. Cairns, and D. S. Webster Mar. 1973 116 p refs
(Contract W-31-109-eng-38)
(ANL-7958) Avail: NTIS HC $5.45

The use of lithium/sulfur batteries as load-leveling devices in electrical utility networks could provide both economic and ecological benefits in meeting the growing demand for energy. A battery designed for this application should have an initial capital cost of $12 to $15/kW-hr of energy storage capacity and a lifetime of at least five years. A typical duty cycle is expected to be a 10 to 14 hr discharge followed by a 4 to 8 hr charge with the battery operating about 5 days per week. Economic and cell performance goals for the development of a battery system are presented. A preliminary comparison of the costs of batteries, pumped hydroelectric storage and gas

turbines indicates that, under some conditions, batteries should be considered as load-leveling devices. The lithium/sulfur battery system is in too early a state of development to accurately predict its place in the utility system. Author (NSA)

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N73-30059*+ National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 116, JUNE 1973
Jun. 1973 101 p
(NASA-SP-7011(116)) Avail: NTIS HC $4.25 CSCL 06E

This special bibliography lists 336 reports, articles, and other documents introduced into the NASA scientific and technical information system in May 1973. Author

N73-30060*# Scripta Technica, Inc., Washington, D.C.
MOLECULAR MECHANISMS OF ADAPTATION TO HYPOXIA
F. Z. Meyerson NASA Aug. 1973 24 p refs Transl. into ENGLISH from Priroda (Moscow), no. 6, 1972 p 74-81
(Contract NASw-2484)
(NASA-TT-F-15058) Avail: NTIS HC $3.25 CSCL 06S

A discussion is presented on the possible mechanism of adaptation to hypoxia and the role of the respiratory enzymes ATP, RNA, and DNA in adaptation. Data are also given on inhibition of RNA synthesis as a counter adaptive factor indicating RNA's essential role in adaptation. Author

N73-30061# Japan Broadcasting Corp., Tokyo. Technical Research Labs.
NHK TECHNICAL MONOGRAPH NO. 21
Mar. 1973 33 p refs
Avail: NTIS HC $3.75

Results are presented of research activities covering the field of radio and television broadcasting engineering and areas of funamental research which may contribute to the future of broadcasting engineering. Described are investigations conducted into: (1) control mechanism of the accommodation-vergence eye movement system in human eyes; and (2) importance of central and peripheral vision in pattern perception and recognition. For individual titles, see N73-30062 through N73-30063.

N73-30062 Japan Broadcasting Corp., Tokyo.
CONTROL MECHANISM OF THE ACCOMMODATION-VERGENCE EYE-MOVEMENT SYSTEM IN HUMAN EYES
Tatsuo Yoshida and Akira Watanabe *In its* NHK Tech. Monograph Mar. 1973 p 3-20 refs (For availability see N73-30061 21-04)

Each of the two systems of accommodation and vergence eye movement in human eyes is regarded as a servo system when they track a moving target. These systems are closely connected to each other. The control mechanism of this connected system was analyzed by measurement of its input-output relations using control system identification techniques. Using opto-electronic measuring apparatus, the indicial response and frequency response of the system were measured objectively. Two kinds of target systems were used for measurement, one of them a target which moved back and forth and the other displayed on a stereoscope, apparently moving back and forth. A fundamental linear model was constructed to explain the measured characteristics. Statistical characteristics of fluctuations in the responses of the system were analyzed and a model of their generating mechanism was discussed. Author

N73-30063 Japan Broadcasting Corp., Tokyo.
ROLES OF CENTRAL AND PERIPHERAL VISION IN PATTERN PERCEPTION
Akira Watanabe and Tatsuo Yoshida *In its* NHK Tech. Monograph Mar. 1973 p 23-31 refs (For availability see N73-30061 21-04)

An experiment of pattern perception was conducted under the condition that the patterns could be observed with central vision alone by using a TV system combined with an optical device of fixation point detector. The pattern was hidden and its height was 15 deg - 17 deg in subtended visual angle. A subject could make observations by sampling any part of a limited circular area from the hidden pattern, of which diameter was about 3 deg centered on the line of sight. Under such a condition, it was confirmed to be difficult for the subject to perceive person's faces, patterns formed by dotted lines, or even simple and familiar Japanese letters. The result seems to be suggesting that human beings are surprisingly inferior in the ability to build up the image of the whole in the psychological space by successively sampling parts of a pattern. The result also indicates that the peripheral vision plays an important role in the extraction of interrelationship between pattern constituents or of features based on the law of configuration as mentioned in Gestalt psychology. Author

N73-30064*# Public Health Service, Phoenix, Ariz. Environmental Microbiology Section.
SERVICES PROVIDED IN SUPPORT OF THE PLANETARY QUARANTINE REQUIREMENTS OF THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION Technical Report, Apr. - Jun. 1973
Martin S. Favero Jun. 1973 9 p
(NASA Order W-13062)
(NASA-CR-133742; Rept-42) Avail: NTIS HC $3.00 CSCL 06M

The project to evaluate thermal sterilization for unmanned landers is reported. A temperature controlled oven with a nitrogen gas supply containing a known concentration of water is discussed. The studies show that bacillus lentus, bacillus brevis, bacillus coagulans, atypical bacillus spp., and actinomycete are isolated heat survivors. The thermal resistance is given for naturally occurring airborne bacterial spores collected on exposed teflon ribbons. T.M.R.

N73-30065*# Techtran Corp., Silver Spring, Md.
PROBLEMS OF SPACE BIOLOGY. VOLUME 21: TISSUE OXYGEN UNDER EXTREME FLIGHT FACTORS
Ye. A. Kovalenko and I. N. Chernyakov Washington NASA Aug. 1973 264 p refs Transl. into ENGLISH of the book "Problemy Kosmicheskoy Biologii, Tom 21, Kislorod Tkaney pri Ekstemal'nykh Faktorakh Poleta" Moscow, Nauka Press, 1972 264 p
(Contract NASw-2037)
(NASA-TT-F-762) Avail: NTIS HC $6.35 CSCL 06P

The oxygen pressure is observed as it changes in the brain and other important areas of the organism at various altitudes, and when breathing various gas mixtures. The effect of different atmospheric compositions on oxygen pressure in the several tissues under discussion is shown in specific examples on laboratory animals. Prophylaxes of hypoxia, hyperoxia, hyper- and hypocapnia is discussed and ways of accomplishing this through the use of atmospheric component variation are shown. Extreme cases are duplicated, using animals, and detailed tissue oxygen findings are given. Recommendations are made for specific cases in spaceflight and other conditions for creating artificial atmospheres. Author

N73-30066# MAN-Acoustics and Noise, Inc., Seattle, Wash.
THE EFFECT OF SIMULATED SONIC BOOM RISE TIME AND OVERPRESSURE ON ELECTROENCEPHALOGRAPHIC WAVEFORMS AND DISTURBANCE JUDGMENTS Final Report
J. E. Mabry and H. J. Parry Jul. 1973 39 p refs
(Contract DOT-FA73WA-3213)
(FAA-RD-73-115) Avail: NTIS HC $4.00

The 3 main objectives of this study were to: (1) determine the feasibility of investigating the effect of simulated sonic booms, on some sleep patterns of persons undergoing routine electroencephalographic (EEG) examinations, (2) determine the extent that EEG waveforms are altered by the simulated sonic booms, and (3) obtain disturbance judgments as a function of the simulated boom noises. Results were obtained from fifty (50) subjects of both sexes with ages ranging from 15 to 72 years of age. Data was relevant to resting, dozing, or light sleep. The EEG waveforms

for resting or dozing persons were not changed by the simulated boom noises. In general, the subjects were not disturbed by the simulated booms. Ninety-two (92) percent of the subjects reported no disturbance to any of the simulated booms presented. Two rise times of 15 and 7 ms were employed with overpressures ranging from 0.94 to 2.85 PSF. Author

N73-30067*# Scientific Translation Service, Santa Barbara, Calif.
THE OXIDES OF MANGANESE: THEIR COMPARATIVE TOXICITY AND HYGIENIC IMPORTANCE AND THE CLINICAL MEDICINE OF CHRONIC MANGANESE EXPOSURE
N. V. Lazarev, (ed.) and E. N. Levina, (ed.) Washington NASA 4 Sep. 1973 236 p refs Transl. into ENGLISH from State publishing House for Med. lit. (Leningrad), 1962 176 p
(Contract NASw-2483)
(NASA-TT-F-15000) Avail: NTIS HC $14.00 CSCL 06T

The question as to the toxicity differences between the four oxides containing manganese in the form of the bi-, tri-, and quadrivalent metal is discussed. Pathoanatomical and pathohistological changes in certain internal organs and the endocrine glands in intoxication by various manganese oxides are also considered. Author

N73-30068*# Techtran Corp., Silver Spring, Md.
THE AMMONIFYING ABILITY OF THE DENITRIFYING BACTERIA OF THE SPECIES PSEUDOMONAS FLUORESCENS
Yu. V. Kruglov Washington NASA Sep. 1973 9 p refs Transl. into ENGLISH from Tr. Vses. Nauch. Issld. Inst. Selskokhoz. Mikrobiol. (Moscow), v. 15, 1958 p 121-127
(Contract NASw-2485)
(NASA-TT-F-15086) Avail: NTIS HC $3.00 CSCL 06M

The ammonifying activity of denitrifiers and their role in plant nutrition is discussed. Experiments cited show that the bacteria species employed as a denitrifier can indeed be an ammonifier when peptone is used as a source of nitrogen and carbon nutrition. Author

N73-30069*# Ohio State Univ. Research Foundation, Columbus. Dept. of Aeronautical and Astronautical Engineering.
FLUID DYNAMIC ASPECTS OF CARDIOVASCULAR BEHAVIOR DURING LOW-FREQUENCY WHOLE-BODY VIBRATION Final Report, 1 Nov. 1968 - 31 Oct. 1972
Robert M. Nerem Apr. 1973 25 p refs
(Grant NGL-36-008-117; RF Proj. 2732)
(NASA-CR-133843; Rept-15) Avail: NTIS HC $3.25 CSCL 06P

The behavior of the cardiovascular system during low frequency whole-body vibration, such as encountered by astronauts during launch and reentry, is examined from a fluid mechanical viewpoint. The vibration characteristics of typical manned spacecraft and other vibration environments are discussed, and existing results from in vivo studies of the hemodynamic aspects of this problem are reviewed. Recent theoretical solutions to related fluid mechanical problems are then used in the interpretation of these results and in discussing areas of future work. The results are included of studies of the effects of vibration on the work done by the heart and on pulsatile flow in blood vessels. It is shown that important changes in pulse velocity, the instantaneous velocity profile, mass flow rate, and wall shear stress may occur in a pulsatile flow due to the presence of vibration. The significance of this in terms of changes in peripheral vascular resistance and possible damage to the endothelium of blood vessels is discussed. Author

N73-30070# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.
EFFECTS OF TIME SHIFT ON DIURNAL RHYTHMS OF 17-HYDROXY CORTICOSTEROIDE Ph.D. Thesis - Bonn Univ. [AUSWIRKUNGEN DER ZEITVERSCHIEBUNG AUF DIE TAGESRHYTHMIK DER 17-HYDROXYCORTICOSTEROIDE]
Udo Dierlich 20 Mar. 1973 68 p refs In GERMAN; ENGLISH summary
(DLR-FB-73-58) Avail: NTIS HC $5.50; DFVLR, Porz, West Ger. 20,60 DM

The urinary excretion of conjugated and unconjugated 17-hydroxycorticosteroids (17-OHCS) was studied in 8 male students at 3 hour intervals during periods of 24 hours. Two 24 hour preflight periods revealed basic normal daily periodicity of 17-OHCS excretion. Effects of a 6 hour time shift were evaluated by determining the excretion rates after flight from Germany to the USA and vice versa on days 1, 3, 5, and 8 after arrival. A desynchronization with the local time was observed after flights in both directions, the diurnal 17-OHCS excretion patterns being more disturbed, however, after the West-East flight. The resynchronization time of maximum and mininum excretion was 3 to 5 days after the westward travel and 5 to 8 or more after traveling in the opposite direction. It is suggested that the unfavorable flight conditions of the West-East flight (night flight) mainly account for the more marked time shift effects observed after the eastward flight. Author

N73-30071# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.
CONTRIBUTION OF THE ANTICIPATION STRESS TO TOTAL FLIGHT STRESS AND ITS DEPENDENCE ON DIURNAL RHYTHM, MEASURED BY PHYSIOLOGICAL PARAMETERS Ph.D. Thesis - Bonn Univ. [DER ANTEIL DER ERWARTUNGSSPANNUNG AN DER FLIEGERISCHEN GESAMTBELASTUNG UND IHRE ABHAENGIGKEIT VOM TAGESRHYTHMUS, GEMESSEN AN PHYSIOLOGISCHEN GROESSEN]
Peter Kroll 27 Jun. 1972 69 p refs In GERMAN; ENGLISH summary
(DLR-FB-72-39) Avail: NTIS HC $5.50; DFVLR, Porz, West Ger. 18 DM

The rating of anticipation reaction before flight was compared with flight stress. An evaluation was also made of whether the anticipation reaction depends on daytime oscillation and whether it differs from the diurnal pattern of flight stress. Eighteen pilots had to perform a standardized instrument flight in a flight simulator in order to determine pulse rate, ventilation rate, respiratory minute volume, oxygen uptake, and carbon dioxide output before and during a given flight task. The result showed that anticipation reaction coincides with flight stress. Author (ESRO)

N73-30072# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.
BEHAVIOR OF CELL ENZYMES, GLUCOSE, CHOLESTEROL, AND 17-HYDROXYCORTICOSTEROIDS IN BLOOD DURING PHYSICAL EXERCISE AND AS A FUNCTION OF TRAINING CONDITION Ph.D. Thesis - Bonn Univ. [DAS VERHALTEN VON ZELLENZYMEN, GLUCOSE, CHOLESTERIN UND 17-HYDROXY-CORTICOSTEROIDEN IM BLUT UNTER KOERPERLICHER ARBEIT IN ABHAENGIGKEIT VOM TRAININGSZUSTAND]
Gerd Brockkoetter 17 Jul. 1972 55 p refs In GERMAN; ENGLISH summary
(DLR-FB-72-48) Avail: NTIS HC $4.75; DFVLR, Porz, West Ger. 14,70 DM

In 11 untrained and 11 highly trained subjects the alterations of cell enzymes, glucose, cholesterol and 17-OH-corticosteroids were studied in response to physical exercise and in relation to physical condition. The training status was quantified by measuring maximum oxygen uptake. The two groups of subjects showed differences in their responses to physical exercise with respect to aldolase, glucose and 17-OH-corticosteroids. There was no evidence for a close relationship between the status of physical fitness and the extent of the observed alterations; however, a significant coefficient (r = 0,628) was found for the correlation between the maximum oxygen uptake and the resting values of plasma aldolase. Author (ESRO)

N73-30073# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.
CIRCADIAN RHYTHM VARIATIONS OF CIRCULATION RESPIRATION, AND CATABOLISM UNDER FLIGHT STRESS CONDITIONS Ph.D. Thesis - Bonn Univ. [TAGESRHYTHMISCHE SCHWANKUNGEN VON KREISLAUF, ATMUNG UND GASSTOFFWECHSEL UNTER FLIEGERI-

SCHER BELASTUNG]
Wolf-Dieter Steinhoff 26 Jul. 1972 59 p refs In GERMAN; ENGLISH summary
(DLR-FB-72-49) Avail: NTIS HC $5.00; DFVLR, Porz, West Ger. 15,90 DM

In order to determine the circadian rhythms of physiological standards under the stress of flying, the pulse rate, frequency of respiration, O2 inspiration and CO2 expiration were investigated in a flight simulator with 17 airforce pilots. The results showed an exact circadian rhythm with gradual ascent of the physiological activity during the morning hours until a maximum during the early morning. The nightly trough in performance, which is proven once more should be seriously considered in flight schedules of military and civilian aviation. Author (ESRO)

N73-30074# Indian National Scientific Documentation Centre, New Delhi.
SCIENTIFIC CREATIVITY, PART 1
1972 282 p refs Transl. into ENGLISH from the publ. "Nauchnoe Tvorchestvo" Moscow, Nauka, 1969 p 1-277 Sponsored by NSF 3 Vol.
(TT-70-57147-1) Avail: NTIS HC $3.00 CSCL 05K

Papers and lectures compiled at the 1967 U.S.S.R. symposium on the psychology of scientific and technical creativity are reported. The theory of scientific discovery as an essential part of the general theory of science, and discussions on general problems are included. Articles on methodology and historical problems; presentations covering psychological models, cybernetics, methodology, and applications to teaching are reviewed. T.M.R.

N73-30075# Indian National Scientific Documentation Centre, New Delhi.
SCIENTIFIC CREATIVITY, PART 2
1972 300 p refs Transl. into ENGLISH from the publ. "Nauchnoe Tvorchestvo" Moscow, Nauka, 1969 p 278-576 Sponsored by NSF 3 Vol.
(TT-70-57147-2) Avail: NTIS HC $3.00 CSCL 05K
For abstract, see N73-30074.

N73-30076# Indian National Scientific Documentation Centre, New Delhi.
SCIENTIFIC CREATIVITY, PART 3
1972 276 p refs Transl. into ENGLISH from the publ. "Nauchnoe Tvorchestvo" Moscow, Nauka, 1969 p 577-850 Sponsored by NSF 3 Vol.
(TT-70-57147-3) Avail: NTIS HC $3.00 CSCL 05K
For Abstract, see N73-30074.

N73-30077# Naval Postgraduate School, Monterey, Calif.
SUBJECTIVE AND PHYSIOLOGICAL INDICATORS OF FATIGUE IN A VIGILANCE TASK M.S. Thesis
Henry Edgar Innes Mar. 1973 44 p refs
(AD-761503) Avail: NTIS CSCL 06/16

The research represents an investigation to determine intra-correlations among physiological parameters, a subjective rating of fatigue and performance during a vigilance task. Simple and multivariate analyses indicate positive relationships between subjective ratings of fatigue and heart rate, neck muscle tension level and two measures of sinus arryhthmia. Subjective ratings were correlated with time-on-task. Effects of motivation on sinus arryhthmia are discussed in the context of information processing. Single variate correlations between performance and heart rate, as well as with subjective ratings of fatigue, were observed. Multivariate correlation of neck muscle tension level and sinus arryhthmia was obtained. (Modified author abstract) GRA

N73-30904 Joint Publications Research Service, Arlington, Va.
CURRENT RESEARCH RESULTS AND FUTURE EFFORTS IN THE PROBLEM OF THE BIOLOGICAL EFFECT OF MICROWAVE RADIATION IN THE DEPARTMENT OF PHYSICAL INJURY AT THE INSTITUTE OF INDUSTRIAL MEDICINE
Henryk Mikolajczyk *In its* Transl. on Eastern Europe: Sci. Affairs, No. 343 (JPRS-59709) 3 Aug. 1973 p 4-15 refs Transl. into ENGLISH from Med. Lotnicza (Warsaw), no. 39, 1972 p 95-104 Presented at Symp. on the Biol. Effect of Microwaves, the Employment of Lasers in Biol. and Med., and Protection against Nonionizing Radiation, Warsaw, 28-30 Oct. 1971 (For availability see N73-30890 21-34)

N73-30905 Joint Publications Research Service, Arlington, Va.
PROPOSALS FOR SPECIFICATION OF ALLOWABLE LEVELS OF MICROWAVE RADIATION
Przemyslaw Czerski and Mieczyslaw Piotrowski *In its* Transl. on Eastern Europe: Sci. Affairs, No. 343 (JPRS-59709) 3 Aug. 1973 p 16-28 refs Transl. into ENGLISH from Med. Lotnicza (Warsaw), no. 39, 1972 p 127-139 (For availability see N73-30890 21-34)

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N73-30078* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TILTING TABLE FOR ERGOMETER AND FOR OTHER BIOMEDICAL DEVICES Patent
Raymond L. Gause and Raymond A. Spier, inventors (to NASA) Issued 7 Aug. 1973 8 p Filed 8 May 1972 Supersedes N72-25127 (10 - 16, p 2114)
(NASA-Case-MFS-21010-1; US-Patent-3,750,479; US-Patent-Appl-SN-251609; US-Patent-Class-73-379) Avail: US Patent Office CSCL 06B

The apparatus is for testing the human body in a variety of positions, ranging from the vertical to the supine, while exercising on an ergometer; and can also be used for angular positioning of other biomedical devices. It includes a floor plate and a hinged plate upon which to fix the ergometer, a back rest and a head rest attached at right angles to said hinged plate and behind the seat of the ergometer, dual hydraulic cylinders for raising and lowering the hinged plate through 90 deg by means of a self contained hydraulic system, with valve means for control and positive stops on the apparatus to prevent over travel. Tests can be made with the subject positioned on the seat of the ergometer, through the various angles, with a substantially normal body attitude relative to the seat and ergometer.
Official Gazette of the U.S. Patent Office

N73-30079*# Translation Consultants, Ltd., Arlington, Va.
ERGONOMICS: PRINCIPLES AND RECOMMENDATIONS, NO. 1
V. P. Zinchenko, ed. Washington NASA Jun. 1973 237 p refs Transl. into ENGLISH of the book "Ergonomika: Printsipy i Rekomedatsii, Vyt. 1" Moscow, All-Union Sci. Res. Inst. for Aesthetic Styling in Eng., 1970 246 p
(Contract NASw-2030)
(NASA-TT-F-716) Avail: NTIS HC $3.00

An attempt was made to write creative theoretical, methodological, and normative materials that consider the human factor when designing new technologies, particularly automated control systems. Special attention is devoted to principles of job analysis, to the construction of informative models, and to experimental methods of making ergonomic investigtions. For individual titles, see N73-30080 through N73-30087.

N73-30080* Translation Consultants, Ltd., Arlington, Va.
ERGONOMIC PREREQUISITES FOR ARTISTIC DESIGNING
V. M. Munipov, V. P. Zinchenko, B. F. Lomov, and P. Ya. Shlayen *In its* Ergonomics: Principles and Recommendations, No. 1 (NASA-TT-F-716) Aug. 1973 p 126 refs Transl. into ENGLISH from the book "Ergonomika: Printsipy i Rekomedatsii, Vyp. 1" Moscow, All-Union Sci. Res. Inst. for Aesthetic Styling in Eng., 1970 p 5-32 (For availability see N73-30079 21-05)

An analysis was made of current problems of ergonomics and engineering psychology as well as certain aspects of the interaction between artists-designers and ergonomists in the planning process. Author

N73-30081* Translation Consultants, Ltd., Arlington, Va.
ANALYSIS OF OPERATOR PARTICIPATION
G. M. Zarakovskiy and V. P. Zinchenko *In its* Ergonomics: Principles and Recommendations, No. 1 (NASA-TT-F-716) Jun. 1973 p 27-46 refs Transl. into ENGLISH from the book "Ergonomika: Printsipy i Rekomedatsii, Vyp. 1" Moscow, All-Union Sci. Res. Inst. for Aesthetic Styling in Eng., 1970 p 33-53 (For availability see N73-30079 21-05)

The problem of providing a psychological conception of the analysis of operator participation in a form that will allow the qualitative approach to be combined with the quantitative approach is examined. This conception is based on an understanding of the essence of human endeavor in automated control systems that now determine the development of society's productive forces and that are the main object of ergonomic research. Two main types of operator participation were examined; information retrieval with immediate service and information retrieval with delayed service. Author

N73-30082* Translation Consultants, Ltd., Arlington, Va.
DESIGNING CONTROL SYSTEM INFORMATION MODELS
K. I. Panin and V. P. Zinchenko *In its* Ergonomics: Principles and recommendations, No. 1 (NASA-TT-F-716) Jun. 1973 p 47-82 refs Transl. into ENGLISH from the book "Ergonomika: Printsipy i Rekomedatsii, Vyp. 1" Moscow, All-Union Sci. Res. Inst. for Aesthetic Styling in Eng., 1970 p 55-90 (For availability see N73-30079 21-05)

Problems encountered in modeling information models are discussed, Data cover condition, functioning of the object of control, and the environment involved in the control. Other parameters needed for the model include: (1) information for forming an image of the real situation, (2) data for analyzing and evaluating an evolving situation, (3) planning actions, and (4) data for observing and evaluating the results of model realization. Author

N73-30083* Translation Consultants, Ltd., Arlington, Va.
RESEARCH PRINCIPLES AND THE CONSTRUCTION OF MNEMONIC DIAGRAMS
V. F. Venda and A. A. Mitkin *In its* Ergonomics: Principles and Recommendations, No. 1 (NASA-TT-F-716) Jun. 1973 p 83-126 refs Transl. into ENGLISH from the book "Ergonomika: Printsipy i Rekomedatsii, Vyp. 1" Moscow, All-Union Sci. Res. Inst. for Aesthetic Styling in Eng., 1970 p 91-126 (For availability see N73-30079 21-05)

Mnemonic diagrams are defined as a variety of information display devices, the essential element of which is conventional graphical presentation of technological or functional-operational links in a controlled system or object. Graphically displaying the operational structure of an object, the interdependence between different parameters, and the interdependence between indicators and control organs, the mnemonic diagram reduces the load on the operator's memory and facilitates perception and reprocessing of information and decision making, while at the same time playing the role of visual support to the information activity of the operator. The types of mnemonic diagrams are listed. Author

N73-30084* Translation Consultants, Ltd., Arlington, Va.
FUNCTIONAL STATES OF THE OPERATOR
V. I. Medvedev *In its* Ergonomics: Principles and Recommendations, No. 1 (NASA-TT-F-716) Jun. 1973 p 119-151 refs Transl. into ENGLISH from the book "Ergonomika: Printsipy i Rekomedatsii, Vyp. 1" Moscow, All-Union Sci. Res. Inst. for Aesthetic Styling in Eng., 1970 p 127-159 (For availability see N73-30079 21-05)

A study was made of the changes that occur in the functional state of the operator as he does his job. The functional state of the operator is understood to mean the available characteristics of his functions and qualities which, directly or indirectly, determine how he receives, processes, and reads out information. These characteristics change, depending on many conditions found on the job, and can be higher or lower, than those values which exist in the so-called operator rest state, when the person is doing nothing, but is ready to act. A number of environmental factors, directly or indirectly related to the job, act on the operator controlling a system. Analysis of the causes of changes in the functional state suggests they can be broken down into two main groups: those associated with the physical characteristics of the influencing factors, and those attributable to the informational structure of the signals. There are as well many internal causes, primarily changes in the basic properties of those functions on which operator performance depends for the most part, that affect the functional state. Author

N73-30085* Translation Consultants, Ltd., Arlington, Va.
EMOTIONAL STATE AND EFFICIENCY
O. V. Ovchinnikova *In its* Ergonomics: Principles and Recommendations, No. 1 (NASA-TT-F-716) Jun. 1973 p 152-164 refs Transl. into ENGLISH from the book "Ergonomika: Printsipy i Rekomedatsii, Vyp. 1" Moscow, All-Union Sci. Res. Inst. for Aesthetic Styling in Eng., 1970 p 152-164 (For availability see N73-30079 21-05)

An investigation was made of the effect of emotional states - negative and positive - on work performance. Data cover intensity of emotional arousal, personality characteristics of person involved, typological features of person's nervous system, emotional stability of person, and past experience of person. Particular attention was given to emotional stress effects on efficiency, given modern working conditions. E.H.W.

N73-30086* Translation Consultants, Ltd., Arlington, Va.
ERGONOMICS RESEARCH METHODS
S. I. Uspenskiy, S. V Yermakova, L. D. Chaynova, A. A. Mitkin, T. M Gushcheva, Yu. K. Strelkov, and N. F. Tsvetkova *In its* Ergonomics: Principles and recommendations, No. 1 (NASA-TT-F-716) Jun. 1973 p 165-220 refs Transl. into ENGLISH from the book "Ergonomika: Printsipy i Rekomedatsii, Vyp. 1" Moscow, All-Union Sci. Res. Inst. for Aesthetic Styling in Eng., 1970 p 165-220 (For availability see N73-30079 21-05)

Various factors used in ergonomic research are given. They are: (1) anthrometric measurement, (2) polyeffector method of assessing the functional state of man, (3) galvanic skin reaction, (4) pneumography, (5) electromyography, (6) electrooculography, and (7) tachestoscopy. A brief summary is given of each factor and includes instrumentation and results. E.H.W.

N73-30087* Translation Consultants, Ltd., Arlington, Va.
EVALUATING THE EFFICIENCY OF MAN-MACHINE SYSTEMS
B. A. Korolev and P. Ya. Shlayen *In its* Ergonomics: Principles and Recommendations, No. 1 (NASA-TT-F-716) Jun. 1973 p 221-230 refs Transl. into ENGLISH from the book "Ergonomika: Printsipy i Rekomedatsii, Vyp. 1" Moscow, All-Union Sci. Res. Inst. for Aesthetic Styling in Eng., 1970 p 236-244 (For availability see N73-30079 21-05)

Efficiency and the degree of adaptability of a system to cope with problems presented to it are evaluated. Also evaluated are serial production, possible modernization approaches, and operational procedures. The link between system efficiency and cost criteria are included. E.H.W.

N73-30088*# Techtran Corp., Silver Spring, Md.
SANITATION NORMS OF PERMISSIBLE NOISE IN LIVING ACCOMMODATIONS, PUBLIC BUILDINGS, AND IN THE TERRITORY OF HABITABLE BUILDINGS
P. N. Burgasov Washington NASA Aug. 1973 16 p Transl. into ENGLISH of the publ. "Sanitarnyye Normy Dopustimogo Shuma v Pomeshcheniyakh Zhilykh i Obshchestvennykh Zdaniu i na Territorii Zhiloy Zastroyki" Moscow, Min. of Public Health, 1971 13 p
(Contract NASw-2485)
(NASA-TT-F-15065) Avail: NTIS HC $3.00 CSCL 06I

New noise standards are discribed for various types of houses, rest homes; hospitals, camps, public facilities, and streets in residential areas. Examples are provided for coordinating noise measured levels with the standards, so as to obtain, via calculation and measurements, permissible levels of noise. Author

N73-30089*# LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
STUDY OF SPACE SHUTTLE EVA/IVA SUPPORT REQUIREMENTS. VOLUME 1: TECHNICAL SUMMARY REPORT
R. J. Copeland, P. W. Wood, Jr., and R. L. Cox 30 Apr. 1973 456 p
(Contract NAS9-12507)

(NASA-CR-133991; T-192-RP05) Avail: NTIS HC $25.00 CSCL 06K

Results are summarized which were obtained for equipment requirements for the space shuttle EVA/IVA pressure suit, life support system, mobility aids, vehicle support provisions, and energy 4 support. An initial study of tasks, guidelines, and constraints and a special task on the impact of a 10 psia orbiter cabin atmosphere are included. Supporting studies not related exclusively to any one group of equipment requirements are also summarized. Representative EVA/IVA task scenarios were defined based on an evaluation of missions and payloads. Analysis of the scenarios resulted in a total of 788 EVA/IVA's in the 1979-1990 time frame, for an average of 1.3 per shuttle flight. Duration was estimated to be under 4 hours on 98% of the EVA/IVA's, and distance from the airlock was determined to be 70 feet or less 96% of the time. Payload water vapor sensitivity was estimated to be significant on 9%-17% of the flights. Further analysis of the scenarios was carried out to determine specific equipment characteristics, such as suit cycle and mobility requirements. Author

N73-30090*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ULTRASONIC BONE DENSITOMETER Patent Application
James M. Hoop, inventor (to NASA) Filed 8 Aug. 1973 14 p
(NASA-Case-MFS-20994-1; US-Patent-Appl-SN-386789) Avail: NTIS HC $3.00 CSCL 06B

A pair of opposed spaced ultrasonic transducers are held within a clamping apparatus closely adjacent the bone being analyzed. These ultrasonic transducers include piezoelectric crystals shaped to direct signals through the bone encompassed in the heel and finger of the subject being tested. A pulse generator is coupled to one of the transducers and generates an electric pulse for causing the transducers to generate an ultrasonic sound wave which is directed through the bone structure to the other transducer. An electric circuit, including an amplifier and a bandpass filter couples the signals from the receiver transducer back to the pulse generator for retriggering the pulse generator at a frequency proportional to the duration that the ultrasonic wave takes to travel through the bone structure being examined. An oscilloscope and frequency counter is coupled to the bandpass filter for determining the frequency that the pulse generator is retriggered so as to determine changes in the calcium content of the bone being analyzed. NASA

N73-30091*# AiResearch Mfg. Co., Los Angeles, Calif.
SPACE SHUTTLE ENVIRONMENTAL AND THERMAL CONTROL/LIFE SUPPORT SYSTEM STUDY Final Report
J. Rousseau 14 Mar. 1973 255 p
(Contract NAS9-11592)
(NASA-CR-134009; Rept-73-9097) Avail: NTIS HC $14.75 CSCL 06K

The study of the space shuttle environmental and thermal control/life support system is summarized. Design approaches, system descriptions, maintenance requirements, testing requirements, instrumentation, and ground support equipment requirements are discussed. F.O.S.

N73-30092*# Analytical Research Labs., Inc., Monrovia, Calif.
EVALUATION OF SPACECRAFT TOXIC GAS REMOVAL AGENTS Final Report
Dec. 1972 49 p refs
(Contract NAS9-12360)
(NASA-CR-134013; Rept-3005-F) Avail: NTIS HC $4.50 CSCL 06K

A study of the decomposition of various compounds adsorbed on charcoal was made, with a view toward providing a critical appraisal of previous data from charcoal adsorption studies. It was found that thermal decomposition occurs at temperature lower than previously suspected during the charcoal stripping process. A discussion is presented dealing with the various types of reactions found. A rough, quantitative scheme for correcting previous analytical results is developed and presented. Author

N73-30093# Southampton Univ. (England). Inst. of Sound and Vibration Research.
A SURVEY OF HUMAN RESPONSE TO VIBRATION RESEARCH IN GREAT BRITAIN
M. J. Griffin Mar. 1973 66 p
(ISVR-TR-60) Avail: NTIS HC $5.50

Infromation obtained from a questionnaire sent to fifty seven groups in Great Britain known to be interested in human response to vibration is presented. The nature of the various simulation facilities and portable vibration recording systems available is listed. Outline descriptions of laboratory and field experiments conducted since 1965 are presented in tabular form. References to reports published since 1965 are provided as well as number of persons employed in studying human response to vibration in Great Britain. Various research programs planned for the future are presented. ESRO

N73-30094# Army Missile Command, Redstone Arsenal, Ala.
HUMAN FACTORS/HUMAN ENGINEERING (HFHE) Engineering Practice Study
Gerald Chaikin 29 Jun. 1973 32 p refs
(Proj. MISC-0904)
(AD-763168) Avail: NTIS CSCL 05/5

The study identifies program, design criteria and guidance documents comprising the HFHE area in military personnel management and prospective program actions incident to evaluating prospective establishment of an HFHE area assignment. (Modified author abstract) GRA

06 CHEMISTRY

Includes chemical analysis and identification (e.g. spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N73-30095 National Lending Library for Science and Technology, Boston Spa (England).
BLACK HYDROGEN FILMS IN AQUEOUS MEDIA. 1: INTERMOLECULAR INTERACTION AND CONTACT ANGLES
P. M. Kruglyakov, Yu. G. Rovin, and A. F. Koretskii [1973] 10 p refs Transl. into ENGLISH from Izv. Sibirsk. Otd. Akad. Nauk SSSR, Ser. Khim. Nauk (Novosibirsk), no. 1, 1972 p 11-17
(NLL-M-23001-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

A method of determining Hamaker complex constants in hydrocarbon emulsion films on the basis of measurement of the contact angles and interfacial tension was examined. Possible ways of estimating the magnitude and radius of action of the adsorption component of the wedge effect were analyzed. Methods of determining contact angles were examined and their accuracy was scrutinized. Author

N73-30096 National Lending Library for Science and Technology, Boston Spa (England).
DETERMINING THE LIMITING SOLUBILITY OF CARBON IN COBALT IN THE SOLID STATE
V. N. Lnyanoi and A. K. Fetisov [1973] 10 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), v. 1, 1973 p 126-128
(NLL-M-21664-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The phenomenon of surface graphitization of CO-C alloys during vacuum heat treatment is utilized. The temperature at which decomposition of solution begins with different cooling rates has been fixed by high temperature vacuum metallography. The effect of the period of isothermal holding in the single phase region, of thermal cycles, and of the degree of preheat, on the position of the boundary of metastability are taken into account. The following values of solubility were obtained: 0.19% at 875 C; 0.22% at 998 C; 0.32% at 1055 C; 0.40% at 1120 C; 0.50% at 1165 C; 0.63% at 1215 C. Author

N73-30097* Temple Univ. Research Inst., Philadelphia, Pa.
BARIUM RELEASE SYSTEM Patent
Beverley W. Lewis, Charles S. Stokes, Edward W. Smith, and William J. Murphy, inventors (to NASA) Issued 14 Aug. 1973 5 p Filed 31 Jul. 1970 Supersedes N70-36004 (08 - 19, p 3493) Sponsored by NASA

(NASA-Case-LAR-10670-1; US-Patent-3,751,913; US-Patent-Appl-SN-59892; US-Patent-Class-60-215; US-Patent-Class-149-1; US-Patent-Class-149-36; US-Patent-Class-252-305; US-Patent-Class-252-301.4) Avail: US Patent Office CSCL 07D

A chemical system is described for releasing a good yield of free barium neutral atoms and barium ions in the upper atmosphere and interplanetary space for the study of the geophysical properties of the medium. The barium is released in the vapor phase so that it can be ionized by solar radiation and also be excited to emit resonance radiation in the visible range. The ionized luminous cloud of barium becomes a visible indication of magnetic and electrical characteristics in space and allows determination of these properties over relatively large areas at a given time. Official Gazette of the U.S. Patent Office

N73-30098* Midwest Research Inst., Kansas City, Mo.
FLUORINATED ESTERS OF POLYCARBOXYLIC ACIDS Patent

Laurence L. Breed and Richard L. Elliott, inventors (to NASA) Issued 14 Aug. 1973 2 p Filed 23 Sep. 1971 Supersedes N72-10135 (10 - 01, p 0021) Sponsored by NASA (NASA-Case-MFS-21040-1; US-Patent-3,752,847; US-Patent-Appl-SN-183240; US-Patent-Class-260-485F) Avail: US Patent Office CSCL 07D

Fluorine containing esters of polycarboxylic acids are discussed. The use of these esters as extreme temperature lubricants and base fluids for greases is investigated.
Official Gazette of the U.S. Patent Office

N73-30099* Whittaker Corp., Los Angeles, Calif.
POLYURETHANES OF FLUORINE CONTAINING POLYCARBONATES Patent

Floyd D. Trischler and Jerome Hollander, inventors (to NASA) Issued 26 Aug. 1969 2 p Field 30 Dec. 1966 Sponsored by NASA (NASA-Case-MFS-10512; US-Patent-3,463,761; US-Patent-Appl-SN-606027; US-Patent-Class-260-77.5) Avail: US Patent Office CSCL 07C

The polyurethane polymer prepared by reacting a hydroxy-terminated carbonate with an organic diisocyanate is examined.
Official Gazette of the U.S. Patent Office

N73-30100* Whittaker Corp., Los Angeles, Calif.
POLYURETHANES FROM FLUOROALKYL PROPYLENEGLYCOL POLYETHERS Patent

Floyd D. Trischler, inventor (to NASA) Issued 26 Aug. 1969 2 p Filed 30 Dec. 1966 Sponsored by NASA (NASA-Case-MFS-10506; US-Patent-3,463,762; US-Patent-Appl-SN-606036; US-Patent-Class-260-77.5) Avail: US Patent Office CSCL 07C

A description is given of highly stable polyurethane polymers prepared by reacting a polyether with a diisocyanate. Compounded stocks of these polymers may be shaped and cured in conventional equipment used in the rubber industry. The solutions are dispersed gels prepared from the polymers and may be used for forming supported or unsupported films for coating fabrics or solid surfaces, and for forming adhesive bonds between a wide variety of plastics, elastomers, fabrics, metals, wood, leather, ceramics and the like. Official Gazette of U.S. Patent Office

N73-30101* Whittaker Corp., Los Angeles, Calif.
FLUOROHYDROXY ETHERS Patent

Floyd D. Trischler, inventor (to NASA) Issued 24 Jun. 1969 2 p Filed 30 Dec. 1966 Sponsored by NASA (NASA-Case-MFS-10507; US-Patent-3,452,103; US-Patent-Appl-SN-605994; US-Patent-Class-260-615) Avail: US Patent Office CSCL 07C

The preparation of poly(polyfluoroalkylene-glycol) mono (hydroxy polyfluoroalkylene) ethers from fluoroalkylene oxides is described. Official Gazette of the U.S. Patent Office

N73-30102* Whittaker Corp., Los Angeles, Calif.
HIGHLY FLUORINATED POLYMERS Patent Application

Floyd D. Trischler and Jerome Hollander, inventors (to NASA) Filed 4 May 1971 2 p Filed 23 Feb. 1968 Sponsored by NASA (NASA-Case-MFS-11492; US-Patent-3,577,356; US-Patent-Appl-SN-707440; US-Patent-Class-260-2) Avail: US Patent Office CSCL 07C

A description is given of hydroxy containing polyethers which are prepared by the base polymerization of 2-hydro-perhaloisopropyl alcohols having the formula CF3 CH(OH)CH2X, where X is fluorine, chlorine, bromine or iodine.
Official Gazette of the U.S. Patent Office

N73-30103* Whittaker Corp., Los Angeles, Calif.
FLUORINE CONTAINING POLYURETHANE Patent

Floyd D. Trischler, inventor (to NASA) Issued 28 Oct. 1969 2 p Filed 30 Dec. 1966 Sponsored by NASA (NASA-Case-MFS-10509; US-Patent-3,475,384; US-Patent-Appl-SN-605964; US-Patent-Class-260-77.5) Avail: US Patent Office CSCL 07C

A polyurethane polymer prepared by reacting a hydroxy-terminated polyformal with an organic diisocyanate is presented.
Official Gazette of the U.S. Patent Office.

N73-30104# Communications Research Centre, Ottawa (Ontario).
QUENCHING OF THE FLUORESCENCE OF Pr(3 PLUS) IONS IN APROTIC SOLVENTS

A. Watanabe and J. G. Chambers Jul. 1973 16 p refs (CRC-TN-657) Avail: NTIS HC $3.00

The effects of the composition of the solvent on the nonradiative quenching of the fluorescence of Pr(3+) ions dissolved in aprotic solvents are discussed. The value obtained for the radiative efficiency of the 3P sub o level was 0.096. experimental results are also presented for the concentration quenching of the intensity of the 1D2 yields 3H4 transition.
Author

N73-30105# Bureau of Mines, Minneapolis, Minn. Twin Cities Metallurgy Research Center.
DECOMPOSITION OF HYDROGEN SULFIDE IN AN ELECTRICAL DISCHARGE

Larry A. Haas and S. E. Khalafalla 1973 25 p refs (BM-RI-7780) Avail: NTIS HC $3.25 CSCL 07E

Hydrogen sulfide was decomposed to elemental sulfur in an electrical discharge. With He, N2, or Ar diluents, a threshold voltage between 1 and 3 kV was required for the decomposition reaction to occur in a laboratory ozonizer. Above the threshold voltage, the H2S decomposition rate increased with increasing voltage, but the increase was more pronounced with argon diluent than with either nitrogen or helium. In common with other reactions in an electrical discharge, the H2S decomposition decreased with increasing temperature in the range of -41 C to +61 C. The reaction did not appear to be rate-controlled by a solid-gas sorption step because the introduction of activated charcoal into the electrical discharge zone did not significantly affect the decomposition yield. In the presence of polymeric chlorofluorocarbon oil, 90 percent conversion of the 3 percent H2S in helium was obtained at 14 kV, 60 Hz, a 2-mm electrode gap, and a gas-residence time greater than 1 minute. Under the same experimental conditions in the absence of oil, the conversion was only about 50 percent. Author

N73-30106*# Aeronautical Research Associates of Princeton, Inc., N.J.
THE DEVELOPMENT AND PRELIMINARY APPLICATION OF AN INVARIANT COUPLED DIFFUSION AND CHEMISTRY MODEL Final Report

Glenn R. Hilst, Coleman duP. Donaldson, Milton Teske, Ross Contiliano, and Johnny Freiberg Washington NASA Sep. 1973 83 p refs
(Contract NAS1-11433)
(NASA-CR-2295; Rept-193) Avail: NTIS HC $3.75 CSCL 07D

In many real-world pollution chemical reaction problems, the rate of reaction problems, the rate of reaction may be greatly affected by unmixedness. An approximate closure scheme for a chemical kinetic submodel which conforms to the principles of invariant modeling and which accounts for the effects of inhomogeneous mixing over a wide range of conditions has been developed. This submodel has been coupled successfully with invariant turbulence and diffusion models, permitting calculation of two-dimensional diffusion of two reacting (isothermally)

chemical species. The initial calculations indicate the ozone reactions in the wake of stratospheric aircraft will be substantially affected by the rate of diffusion of ozone into the wake, and in the early wake, by unmixedness. Author

N73-30107*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IDENTIFICATION OF A NEW LITHIUM OXIDE, Li3O2
Stephen Stecura Washington Sep. 1973 12 p refs
(NASA-TM-X-2888; E-7381) Avail: NTIS HC $2.75 CSCL 07B

Lithium oxide (Li3O2) was prepared by decomposing anhydrous lithium hydroxide at 360 C in 48 hours and between 640 and 730 C in times up to 1.3 hours and pressures of about 0.00001 torr. Decompositions were done in nickel, molybdenum, niobium, tantalum, and the T-111 tantalum alloy (Ta - 8-wt.% W - 2 wt.% Hf) containers. This oxide probably belongs to the simple orthorhombic system with the following lattice parameters: a = 108.4 + or - 0.4 nm (10.84 + or - 0.04 A), b = 128.4 + or - 0.5 nm (12.84 + or - 0.05 A), and c = 103.6 + or - 0.4 nm (10.36 + or - 0.04 A). Author

N73-30108*# Rice Univ., Houston, Tex. Dept. of Chemical Engineering.
MOESSBAUER SPECTRA OF FERRITE CATALYSTS USED IN OXIDATIVE DEHYDROGENATION
W. Ronald Cares and Joe W. Hightower [1971] 19 p refs (Grant NGR-23-005-074)
(NASA-CR-133740) Avail: NTIS HC $3.00 CSCL 07D

Room temperature Mossbauer spectroscopy was used to examine bulk changes which occur in low surface area CoFe2O4 and CuFe2O4 catalysts as a result of contact with various mixtures of trans-2-butene and O2 during oxidative dehydrogenation reactions at about 420 C. So long as there was at least some O2 in the gas phase, the CoFe2O4 spectrum was essentially unchanged. However, the spectrum changed from a random spinel in the oxidized state to an inverse spinel as it was reduced by oxide ion removal. The steady state catalyst lies very near the fully oxidized state. More dramatic solid state changes occurred as the CuFe2O4 underwent reduction. Under severe reduction, the ferrite was transformed into Cu and Fe3O4, but it could be reversibly recovered by oxidation. An intense doublet located near zero velocity persisted in all spectra of CuFe2O4 regardless of the state of reduction. Author

N73-30109*# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
EXTRAPOLATION OF THERMOPHYSICAL PROPERTIES DATA FOR OXYGEN TO HIGH PRESSURES (5000 TO 10,000 psia) AT LOW TEMPERATURES (100-600 R)
L. A. Weber Nov. 1971 40 p refs
(NASA Order W-13353; NBS Proj. 2750447)
(NASA-CR-133858; NBS-10727) Avail: NTIS HC $4.00 CSCL 07D

Thermophysical properties data for oxygen at pressures below 5000 psia have been extrapolated to higher pressures(5,000-10,000 psia) in the temperature range 100-600 R. The tables include density, entropy, enthalpy, internal energy, speed of sound, specific heat, thermal conductivity, viscosity, thermal diffusivity, Prandtl number, and dielectric constant. Author

N73-30110# Philips Gloeilampenfabrieken N. V., Eindhoven (Netherlands). Forschungslaboratorium.
ACCURATE DETERMINATION OF Ga IN Ga SUB xSe SUB y BY MEANS OF NEUTRON ACTIVATION: A COMPARISON WITH X-RAY FLUORESCENCE AND WET CHEMICAL METHODS
E. Bruninx 1972 8 p refs
(Conf-721069-41) Avail: AEC Depository Libraries

The determination of Ga in Ga-Se was considered. Sample preparation, irradiation, counting methods, and data evaluation are discussed. An overall accuracy of the order of 0.1% was obtained. Systematic errors and various sources of inaccuracy are considered. Author (NSA)

N73-30111# Interuniversitair Reactor Instituut, Delft (Netherlands).
LIGAND EXCHANGE IN IRIDIUM HEXAHALOCOMPLEXES. PART 2: INFLUENCE OF THE pH ON THE REACTIONS OF THE HEXACHLOROIRIDITE AND HEXACHLOROIRIDATE IONS IN AQUEOUS SOLUTIONS
W. J. vanOoij and J. P. W. Houtman 1973 17 p refs Submitted for publication
(IRI-133-73-02-PT-2) Avail: NTIS HC $3.00

The study of the reactions of the hexachloroiridite ion was extended to alkaline solutions. In addition the behavior of the hexachloroiridate ion under various conditions was investigated. Several aquation, redox and polymerization reactions were found to take place. The reaction products were separated by electrophoretic techniques on paper and on thin layers. Author (ESRO)

N73-30112# Tyco Labs., Inc., Waltham, Mass.
COMPOSITION OF NONAQUEOUS SOLUTIONS OF POTENTIAL USE IN HIGH ENERGY DENSITY BATTERIES Final Report, 15 Nov. 1969 - 14 Nov. 1972
David R. Cogley, James N. Butler, and John C. Synnott Dec. 1972 250 p refs
(Contract F19628-70-C-0095; AF Proj. 8659)
(AD-763140; C-948; AFCRL-72-0713) Avail: NTIS CSCL 07/4

Rational development of high energy density batteries based on aprotic organic electrolytes requires considerable physiochemical knowledge of these electrolytes and their interaction with electrodes used in batteries. In many cases, the solubility and reactivity of the cathode material have proven to be the most important factor in determining the shelf life of prototype batteries. These parameters may depend critically on small amount of impurities, such as water or other organic solvents, which may be present in the electrolyte used to prepare an actual cell. The scope of the report includes studies of the solubility equilbria of such potential cathode materials as CuF2, NiF2, ZnF2, CdF2, and AgF2 in aprotic solvents such as dimethyl sulfoxide (DMSO, dimethyl formamide (DMF), and PC. The program also encompasses studies of the coordination of ions by the solvent and by common impurities (e.g., water). Techniques used in these studies include potentiometry, absorption spectroscopy, and NMR techniques. GRA

N73-30413 Roche Inst. of Molecular Biology, Nutley, N.J.
DEVELOPMENT OF A NEW FLUORESCENT REAGENT AND ITS APPLICATION TO THE AUTOMATED ASSAY OF AMINO ACIDS AND PEPTIDES AT THE PICOMOLE LEVEL
Sidney Udenfriend *In* NBS Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 227-230 refs (For availability see N73-30383 21-14)
(Paper-76A6-747)

N73-30414 National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
CONSIDERATIONS ON ORGANIC COMPOUNDS IN SOLUTION AND INORGANIC IONS IN GLASSES AS FLUORESCENT STANDARD REFERENCE MATERIAL
R. A. Velapoldi *In its* Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 231-244 refs (For availability see N73-30383 21-14)
(Paper-76A6-748)

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N73-30113* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
AUTOMATIC CARRIER ACQUISITION SYSTEM Patent
Robert C. Bunce, inventor (to NASA) Issued 17 Jul. 1973 6 p Filed 13 Dec. 1971 Supersedes N72-20156 (10 - 11, p 1439) Sponsored by NASA
(NASA-Case-NPO-11628-1; US-Patent-3,746,998; US-Patent-Appl-SN-207211; US-Patent-Class-325-420;

US-Patent-Class-325-422; US-Patent-Class-329-120) Avail: US Patent Office CSCL 07B

An automatic carrier acquisition system for a phase locked loop (PLL) receiver is disclosed. It includes a local oscillator, which sweeps the receiver to tune across the carrier frequency uncertainty range until the carrier crosses the receiver IF reference. Such crossing is detected by an automatic acquisition detector. It receives the IF signal from the receiver as well as the IF reference. It includes a pair of multipliers which multiply the IF signal with the IF reference in phase and in quadrature. The outputs of the multipliers are filtered through bandpass filters and power detected. The output of the power detector has a signal dc component which is optimized with respect to the noise dc level by the selection of the time constants of the filters as a function of the sweep rate of the local oscillator.

Official Gazette of the U.S. Patent Office

N73-30114 Auburn Univ., Ala.
A SIMULATION OF ANTENNA POINTING ERRORS DUE TO GROUND REFLECTION MULTIPATH PROPAGATION Ph.D. Thesis
James Cantwell Sanderlin 1972 374 p
Avail: Univ. Microfilms Order No. 73-5226

A unique digital computer simulation of monopulse radar antenna pointing errors due to ground reflection multipath propagation is developed. The computer program is designed to simulate the antenna elevation and azimuth pointing errors of either an actual radar located on a site where the terrain conductions are known, or of a hypothetical radar located on an arbitrary site. The major contributors to ground reflection multipath errors are modeled in the simulation. These are: the monopulse radar antenna patterns, the monopulse tracking system, the target bistatic scattering pattern, and the terrain and vegetation in the vicinity of the radar. Common analytic antenna pattern functions for a monopulse radar are included in the simulation. In addition, provisions are made for the use of suitable, arbitrary analytic pattern functions. The sensing functions and monopulse tracking loops for pure amplitude monopulse, pure phase monopulse, as well as sum and difference monopulse are included in the simulation. Dissert. Abstr.

N73-30115* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
TELEVISION MULTIPLEXING SYSTEM Patent
Lorenz G. Simpkins, inventor (to NASA) Issued 31 Jul. 1973 7 p Filed 5 May 1972 Supersedes N72-25184 (10 - 16, p 2122)
(NASA-Case-KSC-10654-1; US-Patent-3,749,831; US-Patent-Appl-SN-250766; US-Patent-Class-178-6.8; US-Patent-Class-178-6.6DD; US-Patent-Class-178-DIG.23; US-Patent-Class-179-15BS) Avail: US Patent Office CSCL 17B

A television multiplexing system which includes a circuit that inserts a digital codes sync signal and a digital code into a video signal for identifying the channel is described. The digital sync signal and the digital coded signals are generated by a single crystal controlled clock so that they are always in synchronism with each other. In demultiplexing the signals are utilized for shifting the digital coded signals into a shift register. The shift register, in turn, activates a decoder according to the code stored in the shift register for selecting the proper recording disk or receiver for storing the video signal.

Official Gazette of the US Patent Office

N73-30116*# Stanford Univ., Calif. Radioscience Lab.
STANFORD BISTATIC RADAR EXPERIMENT (S-170) ON APOLLOS 14, 15, AND 16 Final Report
H. T. Howard and G. L. Tyler Jul. 1973 103 p refs
(Contract NAS9-10579)
(NASA-CR-134003) Avail: NTIS HC $7.25 CSCL 17I

No special equipment was placed onboard the vehicles for the bistatic radar experiments which were carried out during the lunar orbit phases of the Apollo 14, 15, and 16 flights. Radio frequency transmissions from the orbiting command service module were directed toward the moon and received on the earth after reflection from the lunar surface. Two wavelengths, 13 cm (2287.5 MHz, S-band) and 116 cm (259.7 MHz, VHF), were used. Data were obtained at the two wavelengths simultaneously during periods when the spacecraft was maneuvered to maintain a predetermined, although changing, attitude with respect to the earth and moon. Data were also obtained at the 116 cm wavelength during periods of inertial hold and SIM bay attitude maneuvers. Author

N73-30117*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MOTION OF THE SOURCES FOR TYPE 2 AND TYPE 4 RADIO BURSTS AND FLARE-ASSOCIATED INTERPLANETARY DISTURBANCES
K. Sakurai and J. K. Chao (Maryland Univ.) Aug. 1973 16 p refs
(NASA-TM-X-70452; X-693-73-247) Avail: NTIS HC $3.00 CSCL 20N

Shock waves are indirectly observed as the source of type 2 radio bursts, whereas magnetic bottles are identified as the source of moving metric type 4 radio bursts. The difference between the expansion speeds of these waves bottles is examined during their generation and propagation near the flare regions. It is shown that, although generated in the explosive phase of flares, the behavior of the bottles is quite different from that of the waves and that the speed of the former is generally much lower. It is shown that the transit times of disturbances between the sun and the earth give information about the deceleration of shock waves to their local speeds observed near the earth's orbit. A brief discussion is given on the relationship among magnetic bottles, shock waves near the sun, and flare-associated disturbances in interplanetary space.

Author

N73-30118# International Telecommunication Union, Geneva (Switzerland).
TELECOMMUNICATION AND THE PEACEFUL USE OF OUTER SPACE
1973 134 p refs
(Rept-12; Booklet-11) Avail: NTIS HC $8.75

The actions taken by the International Telecommunication Union on the peaceful uses of outer space are reported. The international regulation of frequency assignments for space telecommunications is reported. The functions of specific organizations concerned with space communication are defined. Planning functions of the international telecommunications network are described. Author

N73-30119# Howard Univ., Washington, D.C. School of Engineering.
A STUDY ON COMMUNICATION ANTENNA ISOLATION Final Report
Bing A. Chiang FAA Jun. 1973 144 p refs
(Contract DOT-FA73WA-3156)
(FAA-RD-73-94) Avail: NTIS HC $9.25

Problems on FAA communication antennas related to isolation are analyzed. The concept of using progressively phased circular array to achieve high isolation is studied. The method of study is divided into theoretical and experimental. Theoretical study involved using moment method. Symmetrical dipoles were used as elements. Factors analyzed include array radius, antenna size, position accuracy, impedance, radiation pattern, and isolation. The experimental study involved building scale antennas from existing FAA coaxial dipoles and using them as array elements, and simulated matrix feed conditions to study isolation and radiation pattern. An isolation of 55 db was found possible. The concept is shown to provide high isolation in a very limited space which provides flexibility for beam forming and azimuth scanning. Author

N73-30120*# Missouri Univ., Rolla.
DIGITAL DATA DETECTION AND SYNCHRONIZATION Final Report
T. L. Noack and J. F. Morris Aug. 1973 96 p refs
(Grant NGR-26-003-044)
(NASA-CR-132809) Avail: NTIS HC $7.00 CSCL 09F

The primary accomplishments have been in the analysis and simulation of receivers and bit synchronizers. It has been discovered that tracking rate effects play, a rather fundamental role in both receiver and synchronizer performance, but that data relating to recorder time-base-error, for the proper characterization

of this phenomenon, is in rather short supply. It is possible to obtain operationally useful tape recorder time-base-error data from high signal-to-noise ratio tapes using synchronizers with relatively wideband tracking loops. Low signal-to-noise ratio tapes examined in the same way would not be synchronizable. Additional areas of interest covered are receiver false lock, cycle slipping, and other unusual phenomena, which have been described to some extent in this and earlier reports and simulated during the study. Author

N73-30121*# Carnegie-Mellon Univ., Pittsburgh, Pa.
ELECTRO-OPTICAL PROCESSING OF PHASED ARRAY DATA Final Summary Report
David Casasent 1 Aug. 1973 119 p refs
(Contract NAS8-28737; C-MU proj. DCN-2-40-23115-(IF))
(NASA-CR-124375) Avail: NTIS HC $8.00 CSCL 09A

An on-line spatial light modulator for application as the input transducer for a real-time optical data processing system is described. The use of such a device in the analysis and processing of radar data in real time is reported. An interface from the optical processor to a control digital computer was designed, constructed, and tested. The input transducer, optical system, and computer interface have been operated in real time with real time radar data with the input data returns recorded on the input crystal, processed by the optical system, and the output plane pattern digitized, thresholded, and outputted to a display and storage in the computer memory. The correlation of theoretical and experimental results is discussed. Author

N73-30122# Philips Gloeilampenfabrieken N. V., Eindhoven (Netherlands). Development Labs. for Transmitting - and Microwave Tubes.
COMPARATIVE STUDY OF TWT AND KLYSTRON AMPLIFIERS FOR USE AS POWER AMPLIFIERS IN TELEVISION BROADCAST SATELLITES, VOLUME 1 Final Report
J. J. M. Warringa, comp. 14 Aug. 1972 46 p refs 3 Vol.
(Contract ESTEC-1513/71)
(ESRO-CR(p)-267-Vol-1) Avail: NTIS HC $4.50

A study was undertaken to establish the feasibility of high power space qualified microwave amplifiers for use in a television broadcast satellite operating with a 12 GHz down-link frequency. State of the art assessments and development requirements for each proposed amplifier configuration are given and a comparison is made between traveling wave tubes and klystron amplifiers. The summary and conclusions of the study are discussed.
ESRO

N73-30123# Philips Gloeilampenfabrieken N. V., Eindhoven (Netherlands). Development Labs. for Transmitting- and Microwave Tubes.
COMPARATIVE STUDY OF TWT AND KLYSTRON AMPLIFIERS FOR USE AS POWER AMPLIFIERS IN TELEVISION BROADCAST SATELLITES, VOLUME 2 Final Report
11 Sep. 1972 272 p refs 3 Vol.
(Contract ESTEC-1513/71)
(ESRO-CR(P)-268) Avail: NTIS HC $15.75

A study was undertaken to establish the feasibility of high power space qualified microwave amplifiers for use in a television broadcast satellite operating with a 12 GHz down-link frequency. State of the art assessments and development requirements for each proposed amplifier configuration are given and a comparison is made between traveling wave tubes and klystron amplifiers. The final reports on 12 GHz spaceborne klystrons and TWTs are described and electronic power conditioners and heat rejection systems are discussed. A theory of transmission phenomena causing TV distortion in an FM system is given and a survey of the characteristics of power amplifiers is made. ESRO

N73-30124# Philips Gloeilampenfabrieken N. V., Eindhoven (Netherlands). Development Labs. for Transmitting - and Microwave Tubes.
COMPARATIVE STUDY OF TWT AND KLYSTRON AMPLIFIERS FOR USE AS POWER AMPLIFIERS IN TELEVISION BROADCAST SATELLITES, VOLUME 3 Final Report
11 Sep. 1972 57 p 3 Vol.
(Contract ESTEC-1513/71)
(ESRO-CR(P)-269-Vol-3) Avail: NTIS HC $5.00

A study was undertaken to establish the feasibility of high power space qualified microwave amplifiers for use in a television broadcast satellite operating with a 12 GHz down-link frequency. State of the art assessments and development requirements for each proposed amplifier configuration are given and a comparison is made between traveling wave tubes and klystron amplifiers. An analysis of the electronic power conditioning subsystems is made, detailing the low pass filter, HT transformer and choke. A heat pipe system which will remove the heat generated by the amplifiers is also described. ESRO

N73-30125# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
ELECTROMAGNETIC HAZARDS TO ARMY MATERIEL Final Report
19 Mar. 1973 16 p refs
(AD-763141; TOP-1-2-511) Avail: NTIS CSCL 14/2

Describes a method for evaluation of susceptibility of Army materiel to high intensity electromagnetic radiation in the radio frequency spectrum. Emphasis is placed on testing effects to electric initiators and electronic components, especially solid state devices installed in the test item. Provides procedure for instrumentation, sweep testing, exposure testing, and data analysis. Analysis includes compatibility of tested item with criteria as well as development of a susceptibility profile of the tested item. Author (GRA)

N73-30126# Naval Research Lab., Washington, D.C. Plasma Dynamics Branch.
THEORY OF MICROWAVE GENERATION BY AN INTENSE RELATIVISTIC ELECTRON BEAM IN A RIPPLED MAGNETIC FIELD
Wallace M. Manheimer and Edward Ott May 1973 60 p refs
(AD-763337; NRL-MR-2588) Avail: NTIS CSCL 20/14

Motivated by the recent results of Friedman and Herndon the authors have investigated theoretically the stability of a waveguide enclosed relativistic electron beam in a rippled magnetic field. The presence of the ripple can couple negative energy beam modes to positive energy waveguide modes to produce instability and thereby generate microwaves. In the experiment the thickness of the beam is small compared to all other relevant lengths. The nonlinear dynamics of an infinitessimally thin sheet beam is analyzed. The system is described by the orbit equations for the particles, Maxwell's equations, a set of nonlinear boundary conditions across the moving surface and a continuity equation for the moving surface. Author (GRA)

N73-30127*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
BASIC ELEMENTS OF POWER SPECTRAL ANALYSIS
Davis D. Sentman Jun. 1973 65 p refs
(Grant NGL-16-001-002; Contract N00014-68-A-0196-0003)
(NASA-CR-133774; AD-763435; U-of-Iowa-73-24) Avail: NTIS HC $5.25 CSCL 09/4

A short presentation is made on the basic elements of Power Spectral Analysis with emphasis on the Blackman-Tukey method. Short discussions are included on the topics of pre-whitening, spectral windows, and statistical reliability. Examples are included whenever possible, and a FORTRAN subroutine for calculating a power spectrum is presented. Author (GRA)

N73-30128# Sperry Rand Research Center, Sudbury, Mass.
SPACE-TIME INTEGRAL EQUATION APPROACH TO THE LARGE BODY SCATTERING PROBLEM Final Report
C. L. Bennett, A. M. Auckenthaler, R. S. Smith, and J. D. DeLorenzo
Griffiss AFB, N. Y. RADC May 1973 219 p refs
(Contract F30602-71-C-0162)
(AD-763794; SRRC-CR-73-1; RADC-TR-73-70) Avail: NTIS CSCL 17/9

The space-time integral equation approach is extended to the solution of the large body problem for smooth convex targets. This is accomplished by the development of the impulse response augmentation technique that combines the smoothed impulse response, which is computed exactly with the space-time integral equation, and known features of the returns from the specular point, the join regions, and the creeping wave. This technique produces a total impulse response and the frequency response over the entire spectrum. Results are obtained for the

sphere, the prolate spheroid, and the sphere-capped cylinder for axial incidence and are found to be in good agreement with available data. In addition, the polarization dependent effects on the leading edge of the impulse response are determined for the case of nonaxial incidence on smooth convex targets. Results are presented for the impulse response and frequency response of the prolate spheroid and the sphere-capped cylinder for nonaxial incidence with both polarizations. (Modified author abstract)
GRA

N73-30129# Aerojet Electrosystems Co., Azusa, Calif.
A MINIATURIZED 37 GHz LOW NOISE RECEIVER Final Technical Report, 17 May 1972 - 17 Jun. 1973
Jun. 1973 43 p
(Contract N00019-72-C-0515)
(AD-763402; AESC-1744-FR) Avail: NTIS CSCL 09/5

The work describes an approach to achieving miniaturized superheterodyne 37 GHz receivers whose dimensional and performance specifications permit implementation of both passive and active missile borne microwave sensors. GRA

N73-30130# Xerox Computer Systems, El Segundo, Calif.
REAL-TIME TELEMETRY PROCESSING SYSTEM Final Report, Oct. 1971 - May 1973
Gerald L. Robertson Jun. 1973 38 p
(Contract N00019-72-C-0056)
(AD-763469) Avail: NTIS CSCL 09/6

The RTPS, Real-Time Telemetry System, was designed for support of flight testing naval aircraft and processing other types of test data. The system was assembled using standard commercial hardware units and components configured and integrated such that when operated under the control of the RTPS-OS, Real-Time Telemetry Processing System Operating Software, it meets the functional and operational capabilities of the specification. The RTPS has the capability of processing data in Real-Time prerecorded PCM Digital or FM Analog Tapes, and pre-recorded engineering units digital tapes. The outputs of the system are CRT Display, Hardcopy of the CRT Display, strip chart recorders, line printer output, digital readout, and recorded data in digital and/or analog tape form. GRA

N73-30131# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
ELECTRONIC DIGITAL DATA SYNCHRONIZING AND INSTRUMENTATION AMPLIFICATION TECHNIQUES
Terry L. Gannon May 1973 55 p
(AD-763797; AFRPL-TR-73-14) Avail: NTIS CSCL 17/2

The report focuses on two developments while designing and fabricating a computer controlled acquisition and control system. These two items are electronic designs for medium speed digital data synchronizing and high gain true instrumentation amplifiers. Two design concepts and the resulting circuit performance for synchronizing digital data are discussed, and comparisons are made where possible. The instrumentation amplifier design is discussed giving criteria for the proper choice of component values for the particular circuit, along with a comprehensive list of specifications on final performance. The discussion emphasis in both cases is the effective application of modern electronic components combined with proper design concepts in circuits which are not overly complicated, but rather well characterized. (Modified author abstract) GRA

N73-30132# Army Missile Command, Redstone Arsenal, Ala. Advanced Sensors Directorate.
EXPERIMENTAL ARRAY RADAR (EAR) SECOND-PHASE DEVELOPMENT PLAN
John L. Hatcher 1 Mar. 1973 34 p refs
(DA Proj. 1M2-62303-A-214)
(AD-763171; RE-73-12) Avail: NTIS CSCL 17/9

The report describes a second-phase development plan for the US Army Missile Command's (MICOM's) Experimental Array Radar (EAR) program. The Phase 1 EAR system has been developed and implemented. The Phase 2 effort is to design more flexibility of operation into the system without changing some of the more expensive subsystem elements, for example, the transmitter and the antenna. Primary emphasis in the Phase 2 system will be on providing the system with a long pulse capability by implementing pulse compression, additional computer control capability, and frequency agility for flint reduction and by improving the receiver, digital signal processor, and display system. The analytical studies and the hardware experience leading to the Phase 2 system concept are summarized.
Author (GRA)

N73-30133# Transportation Systems Center, Cambridge, Mass.
EXPERIMENTAL PLAN FOR CONDUCTING IONOSPHERIC SCINTILLATION MEASUREMENTS USING ATS GEO-STATIONARY SATELLITES AT 136 AND 1550 MHz Interim Report, Jun. 1971 - Mar. 1972
W. E. Brown, III, G. G. Haroules, and W. I. Thompson Apr. 1973 134 p refs
(Contract DOT-OS-334)
(PB-220564/9; DOT-TSC-OST-73-33) Avail: NTIS HC $3.00 CSCL 17B

A remote unmanned data collection platform is proposed together with detailed design configurations and data collection and analysis procedures. The data collection platform provides a real time readout capability using the ATS-1 or the ATS-3 satellites as a convenient radio relay link. A comprehensive literature search and bibliography are presented in support of the analysis which lead to the design of the remote data collection platform.
Author (GRA)

N73-30134# Office of Radiation Programs, Washington, D.C. Field Operations Div.
ENVIRONMENTAL EXPOSURE TO NONIONIZING RADIATION
May 1973 140 p refs Conf. held at Atlantic City, N. J., 14 Nov. 1972
(PB-220851/0; EPA/ORP-73-2) Avail: NTIS HC $5.45 CSCL 13L

A collection of papers discussing problems and activities related to commerical, medical, and domestic implications of nonionizing radiation is presented. Author

N73-30583 Israel Program for Scientific Translations, Ltd., Jerusalem.
THE RADAR EQUATION AND RADAR CALIBRATION FOR MEASURING MULTIPLE-TARGET REFLECTIVITY
G. P. Beryulev, V. V. Kostarev, I. G. Potemkin, and A. A. Chernikov *In its* Radar Meteorol. (TT-70-50120) 1971 p 21-26 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

N73-30589 Israel Program for Scientific Translations, Ltd., Jerusalem.
RADIO-WAVE SCATTERING IN CLOUDS AND THE RADAR EQUATION
A. A. Chernikov *In its* Radar Meteorol. (TT-70-50120) 1971 p 68-73 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

N73-30590 Israel Program for Scientific Translations, Ltd., Jerusalem.
RESULTS OF RADAR DIRECTION-FINDING OBSERVATIONS OF SHOWERS AND THUNDERSTORMS USING MRL-1 RADAR WITH STORM DIRECTION FINDER
S. M. Galperin, V. D. Stepanenko, M. E. Solomonik, G. F. Shevela, N. V. Baru, and F. I. Burdakov *In its* Radar Meteorol. (TT-70-50120) 1971 p 73-80 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdata., 1968 (For availability see N73-30580 21-20)

N73-30593 Israel Program for Scientific Translations, Ltd., Jerusalem.
RADIO EMISSION AND ABSORPTION OF CLOUDY ATMOSPHERE IN mm AND cm RANGES
A. E. Basharinov and B. G. Kutuza *In its* Radar Meteorol. (TT-70-50120) 1971 p 106-118 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveschaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

N73-30594 Israel Program for Scientific Translations, Ltd., Jerusalem.
EXPERIMENTAL STUDIES OF ATTENUATION AND RADIO EMISSION OF RAIN IN THE SHF RANGE
B. G. Kutuza *In its* Radar Meteorol. (TT-70-50120) 1971 p p 118-126 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

N73-30595 Israel Program for Scientific Translations, Ltd., Jerusalem.
ATTENUATION OF PRECIPITATION REFLECTIONS IN RADARS WITH LINEAR POLARIZATION
N. F. Pavlov *In its* Radar Meteorol. (TT-70-50120) 1971 p p 126-131 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

N73-30599 Israel Program for Scientific Translations, Ltd., Jerusalem.
POLARIZATION CHARACTERISTICS OF ECHO SIGNALS FROM A CLEAR SKY
A. A. Chernikov and A. B. Shupyatskii *In its* Radar Meteorol. (TT-70-50120) 1971 p 157-163 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

N73-30600 Israel Program for Scientific Translations, Ltd., Jerusalem.
BACKSCATTERING DIAGRAMS FOR SOURCES OF REFLECTIONS FROM A CLEAR SKY
A. A. Chernikov *In its* Radar Meteorol. (TT-70-50120) 1971 p 164-168 ref Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

N73-30601 Israel Program for Scientific Translations, Ltd., Jerusalem.
MEASURING SOURCE VELOCITIES FOR REFLECTIONS FROM A CLEAR SKY
A. G. Gorelik and A. A. Chernikov *In its* Radar Meteorol. (TT-70-50120) 1971 p 168-175 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

N73-30602 Israel Program for Scientific Translations, Ltd., Jerusalem.
METEOROLOGICAL NATURE AND CHARACTERISTICS OF ANOMALOUS RADIO ECHOES
G. B. Brylev and A. A. Fedorov *In its* Radar Meteorol. (TT-70-50120) 1971 p 175-184 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

N73-30604 Israel Program for Scientific Translations, Ltd., Jerusalem.
APPLICATION OF RADAR DATA TO SYNOPTIC ANALYSIS
B. Sh. Divinskaya *In its* Radar Meteorol. (TT-70-50120) 1971 p 193-202 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

N73-30605 Israel Program for Scientific Translations, Ltd., Jerusalem.
ACQUISITION OF RADAR METEOROLOGICAL INFORMATION ON CLOUDS, CLOUD SYSTEMS, AND DANGEROUS PHENOMENA
E. M. Salman, V. A. Petrushevskii, S. I. Vaksenburg, and G. F. Shevela *In its* Radar Meteorol. (TT-70-50120) 1971 p 203-219 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

N73-30607 Israel Program for Scientific Translations, Ltd., Jerusalem.
METHODS FOR RAISING POTENTIALS OF mm-BAND METEOROLOGICAL RADARS
G. F. Shevela and S. I. Vaksenburg *In its* Radar Meteorol. (TT-70-50120) 1971 p 234-239 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

N73-30608 Israel Program for Scientific Translations, Ltd., Jerusalem.
RECEIVING DEVICE FOR AUTOMATIC CONVERSION OF RADAR METEOROLOGICAL SIGNALS
N. V. Gornostaev and G. M. Efimov *In its* Radar Meteorol. (TT-70-50120) 1971 p 239-249 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

N73-30609 Israel Program for Scientific Translations, Ltd., Jerusalem.
A METHOD FOR MEASURING RADIO-ECHO INTENSITIES WITH METEOROLOGICAL RADARS
F. I. Burdakov, I. M. Zavelevich, and P. N. Nikolaev *In its* Radar Meteorol. (TT-70-50120) 1971 p 249-255 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

N73-30610 Israel Program for Scientific Translations, Ltd., Jerusalem.
A METHOD FOR REDUCING THE BLIND ZONE OF A METEOROLOGICAL RADAR
S. I. Vaksenburg, N. V. Gornostaev, V. I. Gurevich, and G. F. Shevela *In its* Radar Meteorol. (TT-70-50120) 1971 p 255-262 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

N73-30611 Israel Program for Scientific Translations, Ltd., Jerusalem.
MULTIWAVELENGTH RADARS FOR MICROSTRUCTURE STUDIES OF CLOUDS AND PRECIPITATION
B. Kh. Tkhamokov *In its* Radar Meteorol. (TT-70-50120) 1971 p 263-277 Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N73-30135* Boeing Co., Seattle, Wash.
RADIATION SENSITIVE SOLID STATE SWITCH Patent
Robert J. Hutto, inventor (to NASA) Issued 10 Jul. 1973 7 p Filed 21 Oct. 1970 Supersedes N72-13206 (10 - 04, p. 459) Sponsored by NASA
(NASA-Case-NPO-10817-1; US-Patent-3,745,352; US-Patent-Appl-SN-82649; US-Patent-Class-250-237R; US-Patent-Class-250-239; US-Patent-Class-250-229) Avail: US Patent Office CSCL 09A

A mechanically operable solid state switch suited for use in achieving a variable circuit-switching function is described. This switch is characterized by an annular array of photoresponsive switching devices, disposed in communication with an included source of radiation, and a plurality of interchangeable, mechanically operable interrupter disks. Each disk has a predetermined pattern of transparent and opaque portions. Operative displacement of each disk serves to make and break selected electrical circuits

through the photo responsive devices of said array.
Official Gazette of the US Patent Office

N73-30136 National Lending Library for Science and Technology, Boston Spa (England).
ELECTRONIC COMPUTER TREATMENT OF SPECIFIC CONTACT STRESS OSCILLOGRAMS
A. V. Zinovev, V. G. Usachev, V. T. Torshin, and V. E. Chernilebskii [1973] 11 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Chern. Met. (USSR), v. 1, 1973 p 96-99 In ENGLISH and RUSSIAN
(NLL-M-21662-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The electronic computer treatment of specific contact stress oscillograms is discussed. The desired contact stress graph is presented in the form of a function embracing unknown parameters. The unknown parameters are given initial values and true values are then searched for by minimization of the deviation in the theoretical oscillogram from the experimental oscillogram using the method of least squares. An approximation of the experimental oscillogram serves as the initial approxmation. Author

N73-30137*# Purdue Univ., Lafayette, Ind. School of Civil Engineering.
GEOMETRIC ASPECTS IN DIGITAL ANALYSIS OF MULTISPECTRAL SCANNER (MSS) DATA
Edward M. Mikhail and James R. Baker 1973 37 p refs
(Grant NGL-15-005-112)
(NASA-CR-133641; LARS-042573) Avail: NTIS HC $4.00 CSCL 05B

Present automated systems of interpretation which apply pattern recognition techniques on MSS data do not fully consider the geometry of the acquisition system. In an effort to improve the usefulness of the MSS data when digitally treated, geometric aspects are analyzed and discussed. Attempts to correct for scanner instabilities in position and orientation by affine and polynomial transformations, as well as by modified collinearity equations are described. Methods of accounting for panoramic and relief effects are also discussed. It is anticipated that reliable area as well as position determinations can be accomplished during the process of automatic interpretation. A concept for a unified approach to the treatment of remote sensing data, both metric and nonmetric is presented. Author

N73-30138# National Bureau of Standards, Washington, D.C. Heat Div.
MIDAS MODULAR INTERACTIVE DATA ACQUISITION SYSTEM: DESCRIPTION AND SPECIFICATION
Charles H. Popenoe and Mack S. Campbell (Tri-Com, Inc., Rockville, Md.) Aug. 1973 49 p refs
(NBS-TN-790) Avail: SOD $0.75 as C13.46:790

Modular interactive data acquisition system (MIDAS), a user-oriented, digitial interface system based on CAMAC hardware and USASCII-bus data communication was developed. MIDAS modules enable the experimenter to set up, program, modify and operate automated or computer-controlled experiments independently of the experts. Salient features of the concept are described and operating configurations discussed both with and without computer control. System interface requirements are specified in sufficient detail to enable the design and modules operable within a MIDAS system. Author

N73-30139*# Neoterics, Inc., Cleveland, Ohio.
NASIS DATA BASE MANAGEMENT SYSTEM: IBM 360 TSS IMPLEMENTATION. VOLUME 1: INSTALLATION STANDARDS Final Report
Sep. 1973 23 p refs
(Contract NAS3-14979)
(NASA-CR-134455) Avail: NTIS HC $3.25 CSCL 09B

The installation standards for the (NASIS) data base management system are presented. The standard approach to preparing systems documentation and the program design and coding rules and conventions are outlines. Included are instructions for preparing all major specifications and suggestions for improving the quality and efficency of the programming task. Author

N73-30140*# Neoterics, Inc., Cleveland, Ohio.
NASIS DATA BASE MANAGEMENT SYSTEM: IBM 360 TSS IMPLEMENTATION. VOLUME 2: OVERVIEWS Final Report
Sep. 1973 39 p refs
(Contract NAS3-14979)
(NASA-CR-134456) Avail: NTIS HC $4.00 CSCL 09B

The system overviews of the NASA Aerospace Safety Information System (NASIS) are presented. The overviews are directed toward informing management of a systems capabilities and requirements. The intent of the overviews contains a description of the component's activities and role in the overall system. The description includes charts and diagrams and discussions of the performance requirements and growth potential of the module. Author

N73-30141*# Neoterics, Inc., Cleveland, Ohio.
NASIS DATA BASE MANAGEMENT SYSTEM: IBM 360 TSS IMPLEMENTATION. VOLUME 3: DATA SET SPECIFICATIONS Final Report
Sep. 1973 199 p refs
(Contract NAS3-14979)
(NASA-CR-134457) Avail: NTIS HC $12.00 CSCL 09B

The data set specifications for the NASA Aerospace Safety Information System (NASIS) are presented. The data set specifications describe the content, format, and medium of communication of every data set required by the system. All relevant information pertinent to a particular data set is prepared in a standard form and centralized in a single document. The format for the data set is provided. Author

N73-30142*# Neoterics, Inc., Cleveland, Ohio.
NASIS DATA BASE MANAGEMENT SYSTEM: IBM 360 TSS IMPLEMENTATION. VOLUME 4: PROGRAM DESIGN SPECIFICATIONS Final Report
Sep. 1973 595 p refs
(Contract NAS3-14979)
(NASA-CR-134458) Avail: NTIS HC $31.75 CSCL 09B

The design specifications for the programs and modules within the NASA Aerospace Safety Information System (NASIS) are presented. The purpose of the design specifications is to standardize the preparation of the specifications and to guide the program design. Each major functional module within the system is a separate entity for documentation purposes. The design specifications contain a description of, and specifications for, all detail processing which occurs in the module. Sub-models, reference tables, and data sets which are common to several modules are documented separately. Author

N73-30143*# Neoterics, Inc., Cleveland, Ohio.
NASIS DATA BASE MANAGEMENT SYSTEM: IBM 360 TSS IMPLEMENTATION. VOLUME 5: RETRIEVAL COMMAND SYSTEM REFERENCE MANUAL Final Report
Sep. 1973 79 p refs
(Contract NAS3-14979)
(NASA-CR-134459) Avail: NTIS HC $6.00 CSCL 09B

The retrieval command subsystem reference manual for the NASA Aerospace Safety Information System (NASIS) is presented. The command subsystem may be operated conversationally or in the batch mode. Retrieval commands are categorized into search-oriented and output-oriented commands. The characteristics of ancillary commands and their application are reported. Author

N73-30144*# Neoterics, Inc., Cleveland, Ohio.
NASIS DATA BASE MANAGEMENT SYSTEM: IBM 360 TSS IMPLEMENTATION. VOLUME 6: NASIS MESSAGE FILE Final Report
Sep. 1973 149 p refs
(Contract NAS3-14979)
(NASA-CR-134460) Avail: NTIS HC $9.50 CSCL 09B

The message file for the NASA Aerospace Safety Information System (NASIS) is discussed. The message file contains all the message and term explanations for the system. The data contained in the file can be broken down into three separate sections: (1) global terms, (2) local terms, and (3) system messages. The various terms are defined and their use within the system is explained. Author

N73-30145*# Neoterics, Inc., Cleveland, Ohio.
NASIS DATA BASE MANAGEMENT SYSTEM: IBM 360 TSS IMPLEMENTATION. VOLUME 7: OPERATING SPECIFICATIONS Final Report
Sep. 1973 41 p refs
(Contract NAS3-14979)
(NASA-CR-134461) Avail: NTIS HC $4.25 CSCL 09B

The operation specifications for the NASA Aerospace Safety Information System are presented. The environment which leads to the design, implementation, and installation of the system is described. The manner in which the various components of the system inter-relate is explained. The manner in which the system was installed and subsequently modified is reported. Author

N73-30146*# Neoterics, Inc., Cleveland, Ohio.
NASIS DATA BASE MANAGEMENT SYSTEM: IBM 360 TSS IMPLEMENTATION. VOLUME 8: DATA BASE ADMINISTRATOR USER'S GUIDE Final Report
Sep. 1973 197 p refs
(Contract NAS3-14979)
(NASA-CR-134462) Avail: NTIS HC $12.00 CSCL 09B

The Data Base Administrator User's Guide for the NASA Aerospace Safety Information System is presented. The subjects discussed are: (1) multi-terminal tasking, (2) data base executive, (3) utilities, (4) maintenance, (5) terminal support, and (6) retrieval subsystem. Author

N73-30147*# Radio Corp. of America, Camden, N.J. Advanced Technology Labs.
SUMC MULTIPROCESSING OPERATING SYSTEM (MPOS) REQUIREMENTS DOCUMENT
W. A. Helbig, L. C. Keller, D. A. Nelson, T. T. Schansman, and L. E. Vandergriff [1972] 30 p
(Contract NAS8-29072)
(NASA-CR-124371) Avail: NTIS HC $3.50 CSCL 09B

Described are the requirements established for the multiprocessor operating system (MPOS) to be developed for a multi-processor configuration of the space ultrareliable modular computer (SUMC). Author

N73-30148*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
A SURVEY OF COMPILER OPTIMIZATION TECHNIQUES
Paul B. Schneck [1972] 8 p refs
(NASA-TM-X-69499) Avail: NTIS HC $3.00 CSCL 09B

Major optimization techniques of compilers are described and grouped into three categories: machine dependent, architecture dependent, and architecture independent. Machine-dependent optimizations tend to be local and are performed upon short spans of generated code by using particular properties of an instruction set to reduce the time or space required by a program. Architecture-dependent optimizations are global and are performed while generating code. These optimizations consider the structure of a computer, but not its detailed instruction set. Architecture independent optimizations are also global but are based on analysis of the program flow graph and the dependencies among statements of source program. A conceptual review of a universal optimizer that performs architecture-independent optimizations at source-code level is also presented. Author

N73-30149*# Ampex Corp., Redwood City, Calif. Advanced Technology Div.
DESIGN, FABRICATION, TESTING AND DELIVERY OF A FEASIBILITY MODEL LAMINATED FERRITE MEMORY Final Summary Report, 24 Jun. 1971 - 30 Mar. 1973
Herbert C. Heckler 27 Apr. 1973 33 p
(Contract NAS8-27594)
(NASA-CR-124372; RR-73-6; DRL-271) Avail: NTIS HC $3.75 CSCL 09B

The effect of using multiword addressing with laminated ferrite arrays was made. Both a reduction in the number of components, and a reduction in power consumption was obtained for memory capacities between one million bits and one million words. An investigation into the effect of variations in the processing steps resulted in a number of process modifications that improved the quality of the arrays. A feasibility model laminated ferrite memory system was constructed by modifying a commercial plated wire memory system to operate with laminated ferrite arrays. To provide flexibility for the testing of the laminated ferrite memory, an exerciser has been constructed to automatically control the loading and recirculation of arbitrary size checkerboard patterns of one's and zero's and to display the patterns of stored information on a CRT screen. Author

N73-30150# Israel Program for Scientific Translations, Ltd., Jerusalem.
COMPUTER ELEMENTS AND SYSTEMS: COLLECTION OF PAPERS, ISSUES NO. 38-40, 1970
1973 334 p refs Transl. into ENGLISH of Vychislitelnye Sistemy (Novosibirsk), nos. 38, 39, and 40, 1970 Prepared for NSF
(TT-72-50009) Avail: NTIS HC $18.75

A collection of Soviet articles on computer elements and systems is presented. For individual titles, see N73-30151 through N73-30177.

N73-30151 Israel Program for Scientific Translations, Ltd., Jerusalem.
APPLICATION OF COMPUTER SYSTEMS IN SOLUTION OF COMPLEX PROBLEMS OF PLANNING IN MECHANICAL ENGINEERING
Yu. S. Zavyalov *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 1-16 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 38, 1970 p 3-22 (For availability see N73-30150 21-08)

Problems regarding the planning and preproduction stages in mechanical engineering are discussed, and methods are indicated for their solution using generalized computer systems. The various topics covered include: (1) typical problems involved in planning shapes of parts and structures, (2) computer systems as a tool for automation of planning and design, (3) mathematical models of plane curves obtained in manual planning, and (4) linear model and theory of spline functions. D.L.G.

N73-30152 Israel Program for Scientific Translations, Ltd., Jerusalem.
CUBIC SPLINE INTERPOLATION **c19**
Yu. S. Zavyalov *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 17-58 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 38, 1970 p 23-73 (For availability see N73-30150 21-08)

The interpolation of functions of one variable by cubic spline functions is described. The problem is formulated and the existence and uniqueness of solutions are discussed. Algorithms are presented for solution of the problem and the validity of the sweep method is demonstrated. Examples are given which illustrate that in addition to the simplicity of the computational algorithms, an important advantage of spline interpolation over the classical methods is the rapid convergence of the interpolation process. D.L.G.

N73-30153 Israel Program for Scientific Translations, Ltd., Jerusalem.
BICUBIC SPLINE INTERPOLATION **c19**
Yu. S. Zavyalov *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 59-78 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 38, 1970 p 74-101 (For availability see N73-30150 21-08)

The theory of spline interpolation is extended to the case of two independent variables. The existence and uniqueness problems for bicubic interpolating splines are presented and one type of nonperiodic spline is described. A parallel algorithm is developed for solution of the problem in its general formulation when the domain of independent variables is rectangular. Implementation of the algorithm in a homogeneous computer system is discussed. The case of nonrectangular domains is considered and convergence of the interpolation process is illustrated. D.L.G.

N73-30154 Israel Program for Scientific Translations, Ltd., Jerusalem.
SMOOTH CIRCULAR INTERPOLATION OF CURVES **c19**
V. A. Leus *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 79-95 Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 38, 1970 p 102-127 (For availability see N73-30150 21-08)

Some questions are considered in the approximate solution

of problems of applied geometry. The fundamental problem dealt with is approximation of curves and surfaces in three-dimensional space. Approximation of surfaces can be reduced to interpolation of functions of one variable. Various forms of interpolation by multivalued functions are described. Error bounds are established and the convergence of circular interpolation processes is proved. A brief account is given of the practical implementation of the method. Author

N73-30155 Israel Program for Scientific Translations, Ltd., Jerusalem.

APPLICATION OF COMPUTER SYSTEMS IN INVESTIGATING MATHEMATICAL MODELS IN MECHANICAL ENGINEERING

L. A. Kozlov and V. A. Lvov *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 96-101 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 38, 1970 p 128-137 (For availability see N73-30150 21-08)

Computer systems equipped with graphic input-output units are proposed for the effective investigation of mathematical models of complex objects in mechanical engineering. The case is considered of investigating a mathematical model of the process of load and wear in the crankshaft bearings of an internal combustion piston engine. Presently available techniques are characterized and the difficulties involved in their usage are enumerated. Application of the proposed procedure is discussed for the given case and results obtained using a computer controlled stepped graph-plotter are given. It is suggested that the proposed techniques, together with suitable software, may be applied to the investigation of many other complicated systems of both mechanical and nonmechanical nature. D.L.G.

N73-30156 Israel Program for Scientific Translations, Ltd., Jerusalem.

AN ALGORITHM FOR LOCATION OF MODULES

T. I. Antipova, S. V. Zagranichnaya, and V. A. Tyurenkov *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 102-107 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 38, 1970 p 138-146 (For availability see N73-30150 21-08)

The case is considered in which the following are given: (1) a set of modules, (2) a board on which the modules are to be positioned, and (3) a table of interconnections. Regarding the board as a rectangle in a euclidean space, the internal terminals as points, and the connector fields as the sides of the rectangle; minimal trees are constructed on the board, each of which connects terminals and fields belonging to one bundle. The total lengths of the edges of the trees, corresponding to the interconnection table T and the location V of the modules, are denoted by Sigma (T,V). The problem consists of finding a location V of modules on the board such that Sigma (T,V) is quasiminimal. An algorithm is proposed for solving the problem and the solution is given in two steps; first by location of the modules without orientation, and then by orientation of the modules. D.L.G.

N73-30157 Israel Program for Scientific Translations, Ltd., Jerusalem.

A DEVICE FOR SEMI-AUTOMATIC DIGITAL ENCODING OF GRAPHIC DATA

L. A. Kozlov, V. A. Lvov, E. K. Skvortsov, and N. G. Skvortsov *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 108-111 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 38, 1970 p 147-152 (For availability see N73-30150 21-08)

A semi-automatic encoder of graphic data is described which does not require additional voltage-code converters in order to communicate with the computer. In addition, it provides for autonomous operation with recording of the encoded data on punched tape. The device can be used to encode various types of graphic data: graphs and drawings recorded on paper, X-ray photographs illuminated from below, microfilms projected on the screen of the instrument, and so on. The device may be used as an indicator instead of a light pen, operating simultaneously with a system for graphic output on a CRT screen. In the latter case the field of the instrument is combined with the CRT screen. Author

N73-30158 Israel Program for Scientific Translations, Ltd., Jerusalem.

A SEMI-AUTOMATIC DEVICE FOR ENCODING THREE DIMENSIONAL MODELS

V. I. Beregovoi, V. I. Domarev, L. A. Kozlov, and V. A. Lvov *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 112-115 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 38, 1970 p 112-115 (For availability see N73-30150 21-08)

The design and operation are described of a device which enables the encoding of small models by manually tracing arbitrary three-dimensional curves with the aid of a special tracer. The device is also applicable to the encoding of graphs and drawings. D.L.G.

N73-30159 Israel Program for Scientific Translations, Ltd., Jerusalem.

ON FUNCTIONAL ALGORITHMS FOR HOMOGENEOUS GENERAL-PURPOSE COMPUTER SYSTEMS

V. G. Khoroshevskii *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 119-127 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 39, 1970 p 3-14 (For availability see N73-30150 21-08)

The main functional regimes of homogeneous general-purpose computer systems (GCS) are considered. It is shown that, depending on the complexity of the problems and how they enter the system, homogeneous GCS operate in one of three functional regimes: (1) solution of complex problems, (2) solution of a finite set of problems, and (3) solution of a flow of problems. Two algorithms are described which guarantee effective solution of the problems in GCS; a heuristic algorithm, and an algorithm based on game theoretic methods. The heuristic algorithm allocates independent problems with equal priorities and arbitrary rank to the elementary machines of the system. The algorithm does not involve serious computational difficulties and yields subminimal solution time for sets of problems on the GCS. The second algorithm provides a game-theoretic interpretation of the task of distributing problems of different ranks among elementary machines with nonzero failure probabilities. D.L.G.

N73-30160 Israel Program for Scientific Translations, Ltd., Jerusalem.

FUNCTIONAL ALGORITHMS FOR HOMOGENEOUS GENERAL-PURPOSE COMPUTER SYSTEMS IN SIMPLE SITUATIONS

T. M. Goloskokova and V. G. Khoroshevskii *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 128-136 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 39, 1970 p 15-28 (For availability see N73-30150 21-08)

Two algorithms are considered for allocation of a finite set of simple problems to the elementary machines of a homogeneous general-purpose computer system. In contrast to procedures of mathematical programming, implementation of these algorithms does not involve serious computational difficulties. Results are presented of a statistical treatment of a simulation experiment, and ALGOL programs for the algorithms are given. Author

N73-30161 Israel Program for Scientific Translations, Ltd., Jerusalem.

EFFECT OF THE INDICES OF A COMPUTER SYSTEM ON ITS EXPECTED EARNINGS

E. G. Khoroshevskaya *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 137-142 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 39, 1970 p 29-37 (For availability see N73-30150 21-08)

A method is proposed for calculating the earnings of a homogeneous general-purpose computer system (GCS). The dependence is determined of the earnings on the basic indices of the system. Examples are considered illustrating the organization of GCS at the present level of computer technology, and an ALGOL Program is given for computing the earnings. Author

N73-30162 Israel Program for Scientific Translations, Ltd., Jerusalem.

CALCULATION OF TECHNICAL AND ECONOMIC INDICES OF HIGH-POWER HOMOGENEOUS GENERAL-PURPOSE COMPUTER SYSTEMS

V. G. Khoroshevskii, E. G. Khoroshevskaya, and T. M. Goloskokova

In its Computer Elem. and Systems (TT-72-50009) 1973 p 143-159 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 39, 1970 p 38-60 (For availability see N73-30150 21-08)

Formulas are given for the technical and economic indices of homogeneous general-purpose computer systems (GCS) on the assumption that the number of elementary machines (EMs), number of repair units (RU) failure rate of each EM, repair and switch-in rate of machines, and initial state of the system are arbitrary. Even in manual calculations these formulas produce results which agree, to within accuracy sufficient for practical purposes, with the results of more accurate and laborious computations. The following indices are considered; expected number of serviceable EMs, switchable EMs, busy RUs operating cost, cost functions characterizing the loss due to down time of EMs in the system, and expected earnings. The results are illustrated by examples. Author

N73-30163 Israel Program for Scientific Translations, Ltd., Jerusalem.

COMPARATIVE PERFORMANCE OF HOMOGENEOUS COMPUTER SYSTEMS AND COMPUTERS

L. S. Shum *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 160-163 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 39, 1970 p 61-66 (For availability see N73-30150 21-08)

The performance is compared of homogeneous computer systems and computers for various ranges of computing power and operating conditions. The criteria for this comparison are the cost and computing power of the computer as represented by technology curves. Author

N73-30164 Israel Program for Scientific Translations, Ltd., Jerusalem.

R-LYaPAS: BASIC LANGUAGE FOR SIMULATION OF DIGITAL DEVICES

V. A. Vorobev *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 164-173 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 39, 1970 p 67-80 (For availability see N73-30150 21-08)

Common to most of the currently available languages for simulation of digital devices is the shortcoming that they are oriented to one level of the model; structural, functional, or logical. This necessitates the use of different languages at the various stages of the design process and has an adverse effect on the quality of the simulation. In an attempt to overcome this situation, the basic language is constructed of a growing system for simulation of digital devices. The input language is an extension of the first level of LYaPAS and is accordingly termed extended LYaPAS or R-LYaPAS. The basic for this approach is as follows: (1) The algorithms simulating the functioning of digital computers are logical algorithms, and this is the level to which LYaPAS is oriented. (2) Self-programming is an organic component of the LYaPAS programming system and can be fully utilized without special modifications. (3) The second level of LYaPAS is transferrable almost automatically to R-LYaPAS and makes the simulation system flexible. As the need arises, any new components can be introduced at the second level and thus are subject to practically no restrictions. Author

N73-30165 Israel Program for Scientific Translations, Ltd., Jerusalem.

ON THE FUNCTIONAL ORGANIZATION OF HOMOGENEOUS COMPUTER SYSTEMS

L. S. Shum *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 174-179 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 39, 1970 p 81-88 (For availability see N73-30150 21-08)

The relative addressing is considered of elementary machines in a homogeneous computer system (HCS) and the functioning of a subsystem in execution of a program with complex loops without programmed readjustments. Relative addressing makes it possible to execute parallel programs without alteration in subsystems which differ as to their geometric configurations and positions in the physical structure of the HCS. Author

N73-30166 Israel Program for Scientific Translations, Ltd., Jerusalem.

A CONTROL-ORIENTED LINEAR HOMOGENEOUS COMPUTER SYSTEM

L. S. Shum, Yu. K. Dimitriev, Yu. F. Tomilov, and Yu. N. Potapova *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 180-190 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 39, 1970 p 89-106 (For availability see N73-30150 21-08)

A control-oriented linear homoegeneous computer system (HCS) with partially variable structure is described. The HCS is capable of working both in real time and on a time-sharing basis. It can be used both for control of scientific and technical experiments and production processes, and for computations. Author

N73-30167 Israel Program for Scientific Translations, Ltd., Jerusalem.

COMMUTATOR AND INTERACTION UNIT OF ELEMENTARY MACHINES IN A CONTROL-ORIENTED HOMOGENEOUS COMPUTER SYSTEM

Yu. K. Dimitriev, L. S. Shum, Yu. F. Tomilov, and Yu. N. Potapova *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 191-198 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 39, 1970 p 107-118 (For availability see N73-30150 21-08)

The commutator unit and the principles governing the interaction of the elementary machines are described. The subject matter is treated under the following headings: (1) structure of the commutator unit, (2) realization of the components of the commutator unit, and (3) time diagram of elementary machine interaction. D.L.G.

N73-30168 Israel Program for Scientific Translations, Ltd., Jerusalem.

INTERRUPT SYSTEM OF A CONTROL-ORIENTED HOMOGENEOUS COMPUTER SYSTEM

L. S. Shum and Yu. N. Potapova *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 199-205 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 39, 1970 p 119-127 (For availability see N73-30150 21-08)

The organization and operation are considered of a hardware-software interrupt system for a homogeneous computer system. Various selection circuits for priority requests are evaluated as to hardware requirements and depth. Author

N73-30169 Israel Program for Scientific Translations, Ltd., Jerusalem.

COMPLEX OF ELEMENTS OF A CONTROL-ORIENTED HOMOGENEOUS COMPUTER SYSTEM

Yu. K. Dimitriev and Yu. F. Tomilov *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 206-211 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 39, 1970 p 128-136 (For availability see N73-30150 21-08)

A complex of potential-type logic elements based on a threshold element is considered. Computer components based on this complex are evaluated, and compared with analogous components based on the Ural-10 complex. The complex of potential-type elements employed in the computers of the system described comprises modules of three types, T, D and I, whose basic specifications are given. The design of these elements is similar to that of the unified circuit elements of the Ural-10 complex. Author

N73-30170 Israel Program for Scientific Translations, Ltd., Jerusalem.

SOME DESIGN FEATURES OF DISTRIBUTED GENERAL-PURPOSE COMPUTER SYSTEMS

V. N. Veprik, V. I. Zhiratkov, V. G. Kan, and A. I. Mikhashov *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 212-218 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 39, 1970 p 137-146 (For availability see N73-30150 21-08)

Distributed general purpose computer systems (GCS) are classified according to type of data transmission network, and the design features of each classification are given. The distributed GCS classifications include those with: (1) repeated organization of communication, (2) single organization of communication, (3) communications in fixed directions, and (4) message commutation. D.L.G.

N73-30171 Israel Program for Scientific Translations, Ltd., Jerusalem.
STATIC PARAMETERS OF A MECHANICAL MODEL OF A THIN-FILM ELECTROSTATIC RELAY **c09**
R. G. Lukyanova, S. I. Fadeev, and K. V. Shvedova *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 219-251 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 40, 1970 p 3-50 (For availability see N73-30150 21-08)

The problem considered is one which arises in connection with modelling the operation of a thin film electrostatic relay. The basic problem consists of determining the static deflection of a plate with clamped ends, tensioned by the action of electrostatic attraction forces. Two different solutions of the problem are given; one allowing for rigidity of the plate, and the other without allowance for rigidity. In addition, the formulation is given for determining the tensile stress and rigidity of the plate by resonance. D.L.G.

N73-30172 Israel Program for Scientific Translations, Ltd., Jerusalem.
APPLICATION OF QUADRATIC PROGRAMMING TO OPTIMIZE THE PARAMETERS OF DYNAMIC SYSTEMS
V. K. Korolev *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 252-268 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 40, 1970 p 51-73 (For availability see N73-30150 21-08)

A technique is presented for computation of optimal parameters of dynamic systems, based on quadratic programming. A universal optimization program is described, and a sample computation presented for a computer component. Author

N73-30173 Israel Program for Scientific Translations, Ltd., Jerusalem.
OPTIMIZATION OF A CRYOTRON AUTOMATON
V. K. Korolev *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 269-274 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 40, 1970 p 74-81 (For availability see N73-30150 21-08)

The computation on a Minsk-2 computer of the optimal parameters of an automaton implemented in a cryotron medium is presented. Author

N73-30174 Israel Program for Scientific Translations, Ltd., Jerusalem.
A UNIVERSAL PROGRAM FOR OPTIMIZATION OF ELECTRICAL CIRCUITS
V. K. Korolev *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 275-294 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 40, 1970 p 82-113 (For availability see N73-30150 21-08)

A program is described capable of optimizing the parameters of electrical circuits in both static and dynamic operating conditions. The object function need not be smooth, and the parameters to be optimized are subject to two-added constraints. The program is written in AKI (autocode language for the Minsk-2 computer). Author

N73-30175 Israel Program for Scientific Translations, Ltd., Jerusalem.
APPROXIMATION OF FUNCTIONS OF THE TERMINAL STATE OF A DYNAMIC SYSTEM. ERROR BOUNDS FOR THE APPROXIMATION AND THEIR APPLICATION TO THE SMALL-PARAMETER METHOD **c19**
A. I. Moskalenko *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 295-309 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 40, 1970 p 114-132 (For availability see N73-30150 21-08)

A method is considered for approximation of solutions of a system of differential equations, and error bounds for the approximation are obtained. The application of these bounds to integration of differential equations by the method of small parameters is also considered. Author

N73-30176 Israel Program for Scientific Translations, Ltd., Jerusalem.
ANALYSIS OF THE SPEED OF A CRYOTRON COMPUTING MEDIUM
N. I. Nazarov *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 310-320 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 40, 1970 p 133-148 (For availability see N73-30150 21-08)

The problem considered is that of determining the laws governing the transient response of devices realized in the medium and to derive analytical and numerical methods for determining their speed. A method is proposed to simplify problems concerning transients in loops in a computing medium and to examine them by analytical means. Transients in loops shunted by ladder networks are dealt with. The dependence is determined of the characteristics of transients on their parameters and on the loop parameters. Finally, a method is proposed for numerical analysis of transients in large media. D.L.G.

N73-30177 Israel Program for Scientific Translations, Ltd., Jerusalem.
A FORMAL METHOD FOR CONVERTING LOGICAL DESCRIPTIONS OF CRYOTRON AUTOMATA INTO DIFFERENTIAL EQUATIONS **c19**
S. M. Achasova *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 321-329 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 40, 1970 p 149-161 (For availability see N73-30150 21-08)

A formalization is presented of the derivation of differential equations for cryotron circuits of asynchronous automata. The dynamic processes taking place in such automta are analyzed. Automata realized in a cryotron computing medium are considered on the basis of their state-transition graphs or canonical equations. The methods of synthesis employ matrix notation for logical functions. The result of the synthesis procedure is the incidence matrix, whose elements are zeros and ones, based either on the state-transition graph or on the canonical equations. The incidence matrix completely determines a physical circuit realizing the automaton in the medium, so that it is possible to proceed directly from the matrix to the Kirchhoff equations for the cryotron circuit of the automaton without considering the details of the circuit. The procedure, which is formal in nature, employs only matrix operations and avoids the usually laborious process of setting up and transforming the equations of the various components of the circuit. Author

N73-30178# Florida State Univ., Tallahassee. Dept. of Statistics.
AEROSPACE APPLICATIONS OF STOCHASTIC CONTINUOUS-TIME NONLINEAR PROGRAMMING Final Technical Report, 16 Jun. 1972 - 15 Jun. 1973
Morgan A. Hanson 15 Jun. 1973 6 p
(Grant AF-AFOSR-2345-72)
(AD-763805; AFOSR-73-1139TR) Avail: NTIS CSCL 12/2

The Grant was provided for research into the theoretical and practical aspects of the use of advanced mathematical programming techniques in systems planning and control, particularly in areas such as production, inventory, logistics, transportation and other areas in which linear programming and related techniques have found successful applications. There have been two major developments: Firstly, in order to extend known static programming results in finite dimensional spaces to problems involving continuous-time in particular, certain known results in finite dimensional linear and nonlinear programming have been extended to infinite dimensional abstract spaces; Secondly, certain existing results in continuous-time programming were extended to more general situations. GRA

N73-30179# Hawaii Inst. of Geophysics, Honolulu.
SUPPLEMENT TO DATA TAPE SYSTEM
Patricia Pullen and Gordon W. Groves Jan. 1973 13 p
(Grant NSF GA-17137)
(PB-220452/7; HIG-73-1; Rept-22) Avail: NTIS HC $3.00 CSCL 09B

Data tapes containing files of sea-level and weather time-series have been prepared and are stored in the Hawaii Institute of Geophysics on magnetic tapes. These data tapes are described in HIG data reports number 1 (no HIG number); 2 (HIG-66-17); 4 (HIG-67-6), and 12 (HIG-68-21). The tapes were produced on an IBM computer and are written in 7040 binary with logical records of 250 values. To make the tapes readable on other machines, they have been converted to BCD

with logical records of 750 values on 7-track tapes, herein referred to as formatted data tapes (FDT). The integer format 18 was used for all tapes; placement of the decimal can be determined by comparison with the first and last five values of each file listed in the original data reports. Record numbers are given to aid in corresponding the original tapes with the FDTs. Also included are errata applicable to the aforementioned data reports. GRA

N73-30180# Israel Program for Scientific Translations, Ltd., Jerusalem.
COMPUTER ELEMENTS AND SYSTEMS, NUMBER 32-34, 1969 (COLLECTION OF PAPERS)
1972 310 p refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 32-34, 1969 Sponsored by NSF (TT-71-50054/1) Avail: NTIS HC $6.00 CSCL 09B

A collection of papers concerned with manufacturing methods of computer systems elements and programming methods is presented. GRA

N73-30606 Israel Program for Scientific Translations, Ltd., Jerusalem.
EQUIPMENT COMPLEX FOR AUTOMATIC ACQUISITION AND PROCESSING OF RADAR METEOROLOGICAL DATA
V. A. Petrushevskii, S. M. Persin, G. F. Shevela, E. M. Salman, and S. I. Vaksenburg *In its* Radar Meteorol. (TT-70-50120) 1971 p 219-234 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

N73-30618 Joint Publications Research Service, Arlington, Va.
SORTING ANALOGS TO COMPOSITE-KINEMATIC MAPS OF NATURAL SYNOPTICS PERIODS
O. V. Batyreva and I. I. Orlova *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-59580) 23 Jul. 1973 p 59-68 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 50-57 (For availability see N73-30612 21-20)

N73-30913 Joint Publications Research Service, Arlington, Va.
UNIFIED COMPUTER SYSTEM (RYAD) DESCRIBED
In its Transl. on Eastern Europe: Sci. Affairs, No. 349 (JPRS-59825) 6 Aug. 1973 p 7-11 Transl. into ENGLISH from Inform. -- Elektron. (Budapest), no. 2, 1973 p 123-125 (For availability see N73-30911 21-34)

N73-30914 Joint Publications Research Service, Arlington, Va.
INFORMATION, STATISTICS ON HUNGARIAN COMPUTER COURSES PRESENTED
Adorjan Palfi *In its* Transl. on Eastern Europe: Sci. Affairs, No. 349 (JPRS-59825) 6 Aug. 1973 p 12-20 Transl. into ENGLISH from Inform. -- Elektron. (Budapest), no.2, 1973 p 135-138 (For availability see N73-30911 21-34)

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N73-30181* General Dynamics Corp., San Diego, Calif.
DRIVING LAMPS BY INDUCTION Patent
Helmuth H. Laue and Leonard G. Clough, inventors (to NASA) Issued 10 Jul. 1973 4 p Filed 16 Mar. 1972 Supersedes N72-21252 (10 - 12, p 1587) Sponsored by NASA (NASA-Case-MFS-21214-1; US-Patent-3,745,410; US-Patent-Appl-SN-235269; US-Patent-Class-315-248; US-Patent-Class-313-161; US-Patent-Class-315-324) Avail: US Patent Office CSCL 09C

An electrodeless lamp circuit with a coil surrounding a krypton lamp is driven by an RF input source. A coil surrounding a mercury lamp is tapped across the connection of the input central to the krypton-lamp coil. Each coil is connected in parallel with separate capacitors which form resonant circuits at the input frequency. Official Gazette of the U.S. Patent Office

N73-30182 National Lending Library for Science and Technology, Boston Spa (England).
ELECTROSTATIC DISCHARGE IN LIQUIDS: INTRODUCTORY PAPER
G. Schon [1973] 27 p Transl. into ENGLISH from the publ. "Advances in Static Electricity, Volume 1" Vienna, 1970 p 226 Presented at 1st Intern. Conf. on Static Elec., Vienna, 4-6 May 1970
(NLL-M-23041-(5828.4F)) Avail: Natl. Lending Library, Boston Spa., Engl.: 3 NLL photocopy coupon

The electrostatic discharge in liquids is discussed. The excess space charges that accumulate in flowing liquids due to boundary surface effects are regarded as the additive totals of the mechanically produced discharge current densities and the ohmic current densities produced by the natural electric field. The processes are classified into laminar and turbulent flow currents and filter discharge currents in the liquid develops laminar flow at right angles to the external wall of the filter. Some indications of the importance of the transport and discharge mechanisms for boundary surface phenomena and particle discharge are described. Author

N73-30183 Michigan Univ., Ann Arbor.
THE TRAP-LOADED CYLINDRICAL ANTENNA Ph.D. Thesis
Dean Lance Smith 1972
Avail: Univ. Microfilms Order No. 73-6915

The trap-loaded cylindrical antenna is a cylindrical antenna having one or more traps located in its arms. The traps are either parallel inductor-capacitor circuits or short-circuited transmission line stubs that are designed to be anti-resonant (have essentially an infinite input impedance) at some particular frequency. The study was confined to the properties of trap-loaded cylindrical antennas that contained only one trap in each arm. The effect of the length of the outer section, length of the inner section, diameter of the cylinder, characteristic impedance or inductance-capacitance ratio of the trap, feed-gap width and trap-gap width on the input impedance, radiation pattern, and current distribution were studied both experimentally and with the aid of two numerical solutions of an integral equation for the current distribution. The conclusions drawn from this study are that the design procedure for the trap antenna described by Greenberg (1956), is indeed valid. Dissert. Abstr.

N73-30184 Michigan State Univ., East Lansing.
MULTI-IMPENDANCE LOADING OF LINEAR ANTENNAS FOR IMPROVED TRANSMITTING AND RECEIVING CHARACTERISTICS Ph.D. Thesis
Philip Lyle Fanson 1972 194 p
Avail: Univ. Microfilms Order No. 73-5368

A method by which the transmitting and receiving characteristics of a linear antenna may be improved or modified by the use of multi-loading is reported. The main findings are as follows. For a transmitting antenna if (1) the antenna current is specified at $M + N$ points, (2) the radiation field is specified in $M + N$ directions, (3) the input impedance is specified in $M + N$ different frequencies, or (4) any linear combinations of case (1), (2), and (3), then $M + N$ complex impedances can be found at $M + N$ specified locations. For the case of pure reactive loading with $M + N$ reactances, only $(M + N)/2$ values of the antenna characteristics can be specified. For a receiving antenna, $M + N$ complex impedances can again be found at $M + N$ specified locations if (1) the antenna current is specified at $M + N$ points, (2) the scattered field is specified in $M + N$ directions, or (3) the combination of cases (1) and (2) and if the central load is specified. Dissert. Abstr.

N73-30185* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
FERROFLUIDIC SOLENOID Patent
Eric E. Sabelman, inventor (to NASA) Issued 31 Jul. 1973 8 p Filed 16 Mar. 1972 Supersedes N72-25269 (10 - 16, p 2134) Sponsored by NASA
(NASA-Case-NPO-11738-1; US-Patent-3,750,067; US-Patent-Appl-SN-235295; US-Patent-Class-335-296; US-Patent-Class-335-297) Avail: US Patent Office CSCL 09E

An electromechanical actuator for producing mechanical force and/or motion in response to electrical signals is disclosed. The

actuator includes a ferromagnetic fluid and a coil which are contained within an elastomeric capsule. Energization of the coil by application of current to a pair of coil electrodes extending through the walls of the elastomeric capsule produces distortion of the capsule, i.e., radial expansion and axial contraction. This distortion is caused by the redistribution of the ferromagnetic fluid within the capsule under the influence of the magnetic field. Variation of the current input will produce corresponding variations in the degree of capsule distortion.
Official Gazette of the U.S. Patent Office

N73-30186# Stanford Research Inst., Menlo Park, Calif.
THEORETICAL AND DEVELOPMENT WORK ON HIGH EFFICIENCY AVALANCHE DIODE SOURCES Final Report, 15 Mar. 1971 - 15 Jul. 1972
Robert E. Lee, Don Parker, Ulrich H. Gysel, and Allen F. Podell Washington FAA Sep. 1972 129 p refs
(Contract DOT-TSC-158; SRI Proj. 1135)
(FAA-RD-73-93) Avail: NTIS HC $8.50

Theoretical and developmental work on avalanche diode sources and amplifiers was carried out. Detailed results are presented for both high-power (greater than 1.5-W) C band amplifiers and oscillators using IMPATT diodes. A four-diode amplifier was constructed that is capable of producing more than 8-W output with 6-db gain and more than 5-percent efficiency in the vicinity of 5.2 GHz. The amplifier output could be increased to 10 W but with lower gain. This silicon avalanche diode amplifier has 7-percent, 1-db bandwidth at the 8-W level and showed less than 1-percent FM distortion at moderate modulation indexes. Measurements of the AM and FM noise showed it to be well below the specific level. In fact, measurements at 6-W output showed little difference between the FM noise measured from the avalanche diode amplifier driven by a 1.6-W klystron and the kylstron alone. Author

N73-30187*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PHOTOMULTIPLIER CIRCUIT INCLUDING MEANS FOR RAPIDLY REDUCING THE SENSITIVITY THEREOF Patent Application
James O. McClenahan, inventor (to NASA) Filed 28 Nov. 1972 10 p
(NASA-Case-ARC-10593-1; US-Patent-Appl-SN-310193) Avail: NTIS HC $3.00 CSCL 09A

A simple, reliable and inexpensive control circuit is provided for rapidly reducing the bias voltage across one or more of the dynode stages of a photomultiplier, to substantially decrease its sensitivity to incoming light at those times where excess light intensity might damage the tube. The control circuit comprises a switching device, such as a silicon controlled rectifier (SCR), coupled between a pair of the electrodes in the tube, preferably the cathode and first dynode, or the first and second dynodes, the switching device operating in response to a trigger pulse applied to its gate to short circuit the two electrodes. To insure the desired reduction in sensitivity, two switching devices may be employed between two of the electrode stages, the devices being operated simultaneously to short circuit both stages.
NASA

N73-30188*# Talladega Coll., Ala.
THE EFFECT OF SURFACE CONDITIONS ON THE WORK FUNCTION OF INSULATORS AND SEMICONDUCTORS Annual Report, 1972 - 1973
Aleyamma George 2 Sep. 1973 5 p refs
(Grant NGR-01-007-001)
(NASA-CR-133827) Avail: NTIS HC $3.00 CSCL 09A

Ionization energies of organic semiconductors were determined using single crystals of the material. The theory of the method is essentially that of Millikan's oil drop experiment. The technique employed in the experiment is based on the electrostatic method of balancing a charged particle in an electric field against the force of gravity for different excitation energies above the threshold value, and from an estimate of the balancing voltages, read off the ionization energy from the intercept of the energy axis in a plot wavelength corresponding to the balancing potential for the incident radiation of wavelength. In the modified technique which is adopted in the present experimental investigation, a small single crystal is suspended by a fine quartz fiber between two vertical capacitor plates to which a suitable high voltage is applied. Author

N73-30189*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HOLLOW CATHODES WITH BaO IMPREGNATED, POROUS TUNGSTEN INSERTS AND TIPS
Wayne R. Hudson and Albert J. Weigand 1973 20 p refs Proposed for presentation at 10th Elec. Propulsion Conf., Lake Tahoe, Nev., 31 Oct - 2 Nov. 1973; sponsored by AIAA
(NASA-TM-X-71417; E-7652) Avail: NTIS HC $3.00 CSCL 09A

The technology of impregnated materials is described and some inherently advantageous characteristics of impregnated cathodes are discussed. Thermionic emission measurements are presented for oxide coated and impregnated cathodes. Five cathode configurations with barium oxide impregnated porous tungsten inserts and/or tips have been fabricated and tested. Reliability, durability, and stability of operation are characterized. One of the cathodes has accumulated over 9000 operational hours, another has been cycled on and off more than 800 times. Author

N73-30190*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXPERIMENT FOR DETERMINATION OF ELECTROLUMINESCENT DIODE/DIODE MOUNT THERMAL CHARACTERISTICS
M. Tycz Jul. 1973 7 p refs Submitted for publication
(NASA-TM-X-70440; X-524-73-219) Avail: NTIS HC $3.00 CSCL 09A

A practical laboratory technique is presented for evaluating the thermal characteristics of the diode/diode header combinations in terms of the diode spectrum and efficiency. Experimental data are presented verifying this technique for a GaALAs light emitting homojunction diode mounted on an oxygen-free high conductivity copper header. Author

N73-30191*# General Electric Co., Schenectady, N.Y. Microwave Tube Operation.
SELF-HEALING FUSE DEVELOPMENT Final Report
N. D. Jones, R. E. Kinsinger, and L. P. Harris 30 Jan. 1973 66 p refs
(Contract NAS3-14388)
(NASA-CR-121244) Avail: NTIS HC $5.50 CSCL 09A

The mercury-filled self-healing fuses developed for this program afford very good protection from circuit faults with rapid reclosure. Fuse performance and design parameters have been characterized. Life tests indicate a capability of 500 fuse operations. Fuse ratings are 150 v at 5, 15, 25 and 50 circuit A. A series of sample fuses using alumina and beryllia insulation have been furnished to NASA for circuit evaluation. Author

N73-30192# Army Electronics Command, Fort Monmouth, N.J.
DYNAMIC ELECTRIC FIELD PROFILES IN ELECTRON BEAM SEMICONDUCTOR DEVICES
Maurice Weiner and Joseph W. McGowan Apr. 1973 24 p refs
(DA Proj. 1S6-62705-A-055)
(AD-763296; ECOM-4110) Avail: NTIS CSCL 09/1

The dynamic electric field profiles in the depletion region of Electron Beam Semiconductor (EBS) devices have been obtained. A sinusoidal, density modulated beam is assumed. The profile results have been applied to the problem of finding the peak power limits in an EBS amplifier, operating Class A. The dynamic theory indicates departures from the semistatic theory in output power. The departures are most significant in a rolloff region caused partly or entirely by transit time effects. Author (GRA)

N73-30193# Army Electronics Command, Fort Monmouth, N.J.
A LIGHTWEIGHT ELECTRONICALLY SCANNED ANTENNA INVESTIGATION
John Borowick Jun. 1973 57 p refs
(DA Proj. 1S6-62703-A-175)
(AD-763214; ECOM-4131) Avail: NTIS CSCL 09/5

A C-band waveguide phased array was designed and

constructed as part of an effort to investigate techniques for a lightweight azimuth scanned phased array. The array is composed of sixteen waveguide line sources, each of which has sixteen edge slots. Antenna patterns are calculated from both near field probing and ideal aperture distributions, and then compared to measured patterns. Other parameters necessary for characterizing the array are presented. Performance was generally good, the major problem area being in a high cross polarization level due to the array configuration. Suggestions for improving the performance of the array are given. Author (GRA)

N73-30194# IIT Research Inst., Chicago, Ill. Reliability Analysis Center.
MICROCIRCUIT RELIABILITY BIBLIOGRAPHY
L. B. Berner Apr. 1973 410 p refs
(Contract F30602-73-C-0065)
(AD-763764; RAC-MRB-0473) Avail: NTIS CSCL 09/5

The bibliography identifies selected literature pertinent to the reliability of microelectronic devices. This Bibliography contains over 2500 citations designed to enable the engineering community to do retrospective information searches. The document abstracts are indexed by Document type, Physics of Failure descriptors and Corporate Author. A separate index provides access to related military specifications and standards. References cited are selected from the Reliability Analysis Center file holdings which have been collected from governmental, industrial and dependent laboratory organizations. Author (GRA)

N73-30195# Westinghouse Electric Corp., Baltimore, Md. Systems Development Div.
A WIDE-BAND SPACE FEED SYSTEM STUDY, PART 1 Final Report, 6 Mar. - 31 Aug. 1972
Coleman J. Miller and Daniel Davis Sep. 1972 111 p
(Contract F19628-70-C-0230; DA Proj. 7X2-63304-D-215)
(AD-763767; Rept-72-1119-Pt-1; ESD-TR-72-360) Avail: NTIS CSCL 09/5

The report describes the study and evaluation of a wide bandwidth space feed system for a phased array. The report describes the methods used to optimize the system parameters and evaluate the pattern performance. Results of the optimization and evaluation of a given configuration are presented. A comparison with a confocal paraboloid (nonoptimized) system is made. (Modified author abstract) GRA

N73-30196# Stanford Univ., Calif. High Energy Physics Lab.
THE DEVELOPMENT OF THE SUPERCONDUCTING CAVITY STABILIZED OSCILLATOR
S. R. Stein and J. P. Turneeaure Jun. 1973 15 p refs
(Contract N00014-76-A-0112-0076)
(AD-763684; HEPL-710) Avail: NTIS CSCL 09/5

A very high stability microwave oscillator system was developed which has a high Q superconducting cavity as its frequency determining element. In stabilized oscillator (SCSO), the rf power is generated by a Gunn-Effect oscillator whose frequency is electronically tuned by a varactor diode. An intermediate frequency discriminator is used to produce a feedback voltage which maintains the oscillator at the center of the cavity resonance. An improved stabilization system is now reported which has higher short term stability. GRA

N73-30197# Naval Weapons Lab., Dahlgren, Va.
THE SUSCEPTIBILITY OF X-BAND POINT-CONTACT DIODES TO MICROWAVE RADIATION
R. A. Amadori, V. G. Puglielli, and R. E. Richardson Jun. 1973 28 p refs
(AD-763364; NWL-TR-2963) Avail: NTIS CSCL 09/1

The report describes the techniques and results of an investigation of the susceptibility of 1N23 point-contact microwave diodes to RF (9.375 GHz) energy. Using a minimum change in noise figure of 10 db as the failure criterion, failure levels have been determined as a function of pulse width, pulse repetition frequency, and the number of pulses applied. The two significant results obtained are that the 50-percent failure level is independent of pulse repetition rate at least up to 10 KHz and an empirical expression is derived which predicts these failure levels. This expression is proportional to the log of the pulse width times the number of pulses applied. An analysis of the susceptibility of a hypothetical system under an RF stress condition demonstrated use of the data. (Modified author abstract) GRA

N73-30198# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.
BROADBAND TRANSMITTER TUBE Triannual report, Nov. 1972 - Feb. 1973
M. K. Scherba Jun. 1973 27 p
(Contract DAAB07-72-C-0294)
(AD-763226; EDD-W-5262; ECOM-0294-2-72; AR-2) Avail: NTIS CSCL 09/1

Dual beam electron gun design studies were completed. An electrolytic tank was used to determine the initial gun design. Electron trajectories along with beam characteristics were evaluated using a digital computer program. Both single beam and dual beam experimental electron guns were designed, constructed and evaluated using a demountable electrostatic beam analyzer. Experimentally measured beam characteristics were found to be similar to the theoretically predicted values. A composite circuit structure, consisting of individual left and right handled helices along with connecting straps and support rods, was designed. The design of a composite barrel and wrapped solenoid was also completed. Fixturing and tooling required for assembly of the circuit, barrel and shrink fitting of the circuit into the barrel were designed and ordered. Circuit match studies were also conducted. (Modified author abstract) GRA

N73-30199# IBM Watson Research Center, Yorktown Heights, N.Y.
MAGNETO-OPTIC EFFECTS AT 1.15 MICROMETER IN Gd(.5)Y(2.5)Ga(1) IRON GARNET THIN FILM WAVEGUIDE 5 Quarterly Technical Report, 15 Jan. - 15 Apr. 1973
Samuel C. Tseng, Axel R. Reisinger, and Carl G. Powell Jun. 1973 37 p refs
(Contract N00014-73-C-0256; ARPA Order 2327)
(AD-763792) Avail: NTIS CSCL 09/1

Two (Gd(.5)Y(2.5))(Fe(4)Ga(1))O(12) garnet films deposited on GGG substrates have been tested for possible use as modulators, switches and isolators. Their passive optical waveguiding properties have been characterized at a wavelength of 1.15 micrometer. Modulation of the output, passed through an analyzer, was observed by applying a longitudinal magnetic field. The mode conversion efficiency was shown to be limited primarily by the phase velocity mismatch between TE and TM modes. The possibility of phase modulation of TM modes by a transverse magnetic field is discussed in the light of data obtained in the mode conversion experiments. Author (GRA)

N73-30200# Watkins-Johnson Co., Palo Alto, Calif.
ELECTRON BEAM SEMICONDUCTOR S-BAND AMPLIFIER Triannual Report No. 2, 1 Nov. 1972 - 28 Feb. 1973
Aris Silzars and Lester A. Roberts Mar. 1973 47 p
(Contract DAAB07-72-C-0220)
(AD-763223; W-J72C-4102R2; ECOM-0220-2-72) Avail: NTIS CSCL 09/5

The study of reliability and diode bonding techniques was continued. A designed analysis for semiconductor targets with 100 watts output at 3.2 GHz was carried out. Large signal calculation were made which included transit time and beam penetration effects. The sheet beam electron gun was tested with the pinhole target tube and beam current densities of 5.1 Am/sq mm at 15 kV were achieved at a gun to target distance of approximately six inches. The high power density heat exchanger design was refined. New S-band tuned circuit techniques were improved and an approximately 50 percent yield of void-free bonds between the semiconductor diodes and the target substrate can now be achieved. Life test Tube S/N 1 and S/N 2 were fabricated and preliminary testing was started. (Modified author abstract) GRA

N73-30201# Stanford Research Inst., Menlo Park, Calif.
CONSIDERATIONS IN SHIELDING ANALYSIS OF JOINTS AND CONNECTORS IN CABLE SYSTEMS Technical Report, Jul. 1971 - Feb. 1972
S. Dairiki Kirtland AFB, N. Mex. AFWL May 1973 98 p refs
(Contract F29601-69-C-0127; AF Proj. 1338)

AD-761825; AFWL-TR-73-73) Avail: NTIS CSCL 09/1
Leakage on a shielded-cable system was treated by assuming a current flowing on the exterior surface of a coaxial line. Voltage and current source that depends on leakage through an aperture in the exterior shield is developed to excite the coaxial line. Voltage and current expressions along the coaxial line, terminated in arbitrary impedances, are derived. GRA

N73-30202# Army Electronics Command, Fort Monmouth, N.J.
PACKAGING PRECISION QUARTZ CRYSTAL RESONATORS
John R. Vig and Erich Hafner Jul. 1973 26 p refs
(DA Proj. 1S6-62705-A-058)
(AD-763215; ECOM-4134) Avail: NTIS CSCL 09/1

The causes of aging and thermal hysteresis in quartz resonators are reviewed with emphasis on those aspects which can be influenced by the resonator's packaging. A microcircuit compatible ceramic package design is proposed which is aimed toward optimizing the performance of quartz resonators. The package consists of a frame with a top and a bottom lid. The crystals are mounted in metal clips which are initially highly flexible. After mounting, the clips are strengthened as necessary by electroplating. The package parts can be baked at high temperatures, and are hermetically sealable in ultrahigh vacuum, at room temperature, without the use of large forces. The sealing process relies on the adhesion between atomically clean surfaces. The package is adaptable to sealing in inert atmospheres by alternate techniques. Author (GRA)

N73-30203# Army Electronics Command, Fort Monmouth, N.J.
A CRITIQUE OF CONTACT SURFACE REQUIREMENTS OF MIL-C-39029
J. Spergel and E. F. Godwin Jun. 1973 29 p refs Presented at the Electron. Connectors Syp., Cherry Hill, N. J., Oct. 1971
(DA Proj. 156-62705-A-057)
(AD-763213; ECOM-4130) Avail: NTIS CSCL 09/1

The contact surface requirements of MIL-C-39029 are reviewed in light of recent technological advances regarding plating porosity, smoothness, lubricated surfaces, and corrosion. Specific deficiencies in requirements are discussed, and appropriate changes to the specification are proposed. Methods for evaluating the quality of the surface is proposed in order to establish low porosity, corrosion resistant and electrically stable contact surfaces. By establishing suitable limits of surface contour, porosity and permitting application of lubricants to the surface, the quantity and thereby the cost of gold can be reduced and the durability and corrosion resistance of the contacts can be improved.
Author (GRA)

N73-30204# Microwave Applications Group, Chatsworth, Calif.
MICROWAVE RECIPROCAL LATCHING FERRITE PHASE SHIFTERS Semiannual Report, 1 Oct. 1972 - 31 Mar. 1973
Charles R. Boyd, Jr. Jun. 1973 73 p refs
(Contract DAAB07-73-C-0039)
(AD-763216; ECOM-0039-1) Avail: NTIS CSCL 09/5

The report describes work concerned with the design and fabrication of an S-band dual-mode reciprocal, latching phase shifter using lithium-titanium ferrite. With phase states being scanned rapidly and frequency scanned slowly, a loss level of 1 db with isolated peaks of 1.4 db and 1.3 db has been observed within the 3.1 to 3.5 GHz frequency range at switching times of 100 microseconds and 200 microseconds respectively. Attempts to switch in 50 microseconds have caused erratic increases of insertion loss. This phenomenon could be caused by inadequate uniformity of the remanent flux within the ferrite rod, leading to waveguide mode conversion. To achieve low insertion loss, a low anistropy, low curie temperature material was used. Consequently the phase shifter element exhibits a very strong temperature dependence and thus stabilization of the ambient temperature would be required in practical systems application. (Modified author abstract) GRA

N73-30171 Israel Program for Scientific Translations, Ltd., Jerusalem.
STATIC PARAMETERS OF A MECHANICAL MODEL OF A THIN-FILM ELECTROSTATIC RELAY
R. G. Lukyanova, S. I. Fadeev, and K. V. Shvedova *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 219-251 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 40, 1970 p 3-50 (For availability see N73-30150 21-08)

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N73-30205* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SILENT EMERGENCY ALARM SYSTEM FOR SCHOOLS AND THE LIKE Patent
William S. Read and Vasel W. Roberts, inventors (to NASA) Issued 31 Jul. 1973 8 p Filed 6 Aug. 1971 Supersedes N72-11258 (10 - 02, p 0182) Sponsored by NASA
(NASA-Case-NPO-11307-1; US-Patent-3,750,131; US-Patent-Appl-SN-169671; US-Patent-Class-340-277; US-Patent-Class-340-279) Avail: US Patent Office CSCL 09C

An emergency alert system is described. In a school each classroom (or other area) is instrumented with a hidden microphone and receiver tuned to a non-audible frequency. The receivers' outputs are connected to a central display unit in the school's administrative office. Each instructor is provided with a small concealable transmitter which, when hand activated by the instructor upon the occurrance of any emergency, generates a non-audible signal at the receiver's tuned frequency.
Official Gazette of the U.S. Patent Office

N73-30206# Federal Aviation Administration, Washington, D.C.
TANDEM ELECTRONIC VOICE SWITCHING (EVS) SYSTEM
John F. Schroeder 1 Jun. 1973 142 p refs
(FAA-RD-73-133) Avail: NTIS HC $9.25

The tandem electronic voice switching (EVS) system project plan identifies responsibilities and describes events and activities which must be completed in order to integrate the tandem EVS system with NAS en route stage A. Initial emphasis is on the installation and evaluation testing of a preproduction EVS system at NAFEC for which the System Research and Development Service has primary responsibility. Implementation of the production systems and provides for the transition of primary responsibility to the Airway Facilities Service for this activity is also presented. The tandem EVS system project plan does not assign responsibilities, but rather amalgamates and synchronizes the planning of participating organizations with respect to their inherent responsiblilites for the tandem EVS project. Author

N73-30207*# Massachusetts Inst. of Tech., Cambridge. Electronic Systems Lab.
ON THE DECENTRALIZED CONTROL OF LARGE-SCALE SYSTEMS Ph.D. Thesis
Chee-Yee Chong Jun. 1973 155 p refs
(Grants NGL-22-009-124; AF-AFOSR-2273-72; NSF GK-25781; MIT Proj. DSR-73935; MIT Proj. DSR-76265; MIT Proj. DSR-72917)
(NASA-CR-133857; ESL-R-503) Avail: NTIS HC $9.75 CSCL 09C

The decentralized control of stochastic large scale systems was considered. Particular emphasis was given to control strategies which utilize decentralized information and can be computed in a decentralized manner. The deterministic constrained optimization problem is generalized to the stochastic case when each decision variable depends on different information and the constraint is only required to be satisfied on the average. For problems with a particular structure, a hierarchical decomposition is obtained. For the stochastic control of dynamic systems with different information sets, a new kind of optimality is proposed which exploits the coupled nature of the dynamic system. The subsystems are assumed to be uncoupled and then certain

constraints are required to be satisfied, either in a off-line or on-line fashion. For off-line coordination, a hierarchical approach of solving the problem is obtained. The lower level problems are all uncoupled. For on-line coordination, distinction is made between open loop feedback optimal coordination and closed loop optimal coordination. Author

N73-30208# Royal Aircraft Establishment, Farnborough (England).
RELIABILITY IMPROVEMENT BY REDUNDANCY IN ELECTRONIC SYSTEMS. PART 3: A QUANTITATIVE COMPARISON OF REDUNDANCY SCHEMES
Theresa F. Klaschka Mar. 1973 163 p refs
(RAE-TR-72200; BR34201) Avail: NTIS HC $10.25

Using a previously established method, the performance of a number of redundancy schemes and their variants is assessed in terms of two measures which express the reliability improvement and the penalty associated with applying the redundancy. The relative merits of the redundancy schemes are discussed. on the basis of these results, also taking into consideration some limitations and other factors which are not expressed in the two measures. These results provide designers of equipment employing built-in redundancy with valuable information on which to base a choice of redundancy scheme for a particular application. The redundancy schemes assessed include multiple majority voting, radial logic, stand-by redundnacy, quadded logic, gate connector redundancy, and simple majority voting.
Author (ESRO)

N73-30209# Utah Univ., Salt Lake City. Dept. of Civil Engineering.
THE ENTROPY PROBLEM IN PASSIVE NETWORKS
J. Edmund Fitzgerald Jul. 1973 18 p refs
(Contract N00014-67-A-0325-0001)
(AD-763752; UTEC-73-087) Avail: NTIS CSCL 09/5

Meixner (1972) recently reiterated his discussion of the nonuniqueness of a nonequilibrium entropy using electrically equivalent passive RC-networks. These circuits, part of a problem originally posed by Slepian (1948) are indistinguishable by classical electrical measurements at the input terminals. It is shown herein that the two circuits can be distinguished and their RC-components uniquely determined using simultaneous electrical and thermal observations. The concept of an empirical nonequilibrium temperature such as Meixner posed is essential. It is concluded that while the dissipation function (entropy) is uniquely determined in nonequilibrium conditions for each given RC-circuit, the RC-circuits are not necessarily uniquely determined for each impedance and entropy function. Rather, each nonequilibrium impedance and entropy function defines an equivalence class of RC-networks. This definition is unique to within the equivalence relation. Author (GRA)

N73-30210# Texas Univ., Austin. Electronic Research Center.
TEXAS BIANNUAL OF ELECTRONICS RESEARCH, NUMBER 17 Final Report, 1 Oct. 1972 - 31 Mar. 1973
Arwin A. Dougal 15 May 1973 324 p refs
(Contract F44620-71-C-0091; AF Proj. 4751)
(AD-763729; AFOSR-73-1119TR) Avail: NTIS CSCL 09/3

The report includes recent findings, research investigations, progress reports and future plans in the areas of solid state electronics, information systems, plasma and quantum electronics, bio-medical electronics and acoustics and radio sciences. Modified author abstract) GRA

N73-30211# Admiralty Surface Weapons Establishment, Portsmouth (England).
CIRCUIT OPTIMISATION TECHNIQUES USING A COMPUTER
N. A. Walter Oct. 1972 73 p refs
(AD-763766; ASWE-TR-72-43; BR7243) Avail: NTIS CSCL 09/5

The reliability of an equipment depends upon many things, one of the most important being the accurate design and tolerancing of circuits. This is best achieved by use of the simplest circuit having adequate performance and tolerancing. The tolerancing can be achieved using Monte Carlo techniques, but some means of circuit optimization is desirable. The report discusses the methods of circuit optimization and highlights both the advantages and pitfalls of circuit optimization by computer. A number of examples are used to demonstrate the wide variety of applications possible. Author (GRA)

N73-30212# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
LARGE SCALE INTEGRATION: A DESIGNER'S VIEWPOINT
C. G. Bell, D. P. Bhandarkar, D. L. Feuchi, S. L. Rege, and D. L. Seiwiorek Nov. 1972 75 p refs
(Grant NSF GJ-3275)
(PB-221013/6) Avail: NTIS HC $4.50

Large scale integration (LSI) has conjured up possibilities of a computer-on-a-chip among both users and suppliers in the last five years. There have been many diversified efforts. This has resulted in a large non-trivial array of device technologies, manufacturing methods, interconnection methods and packaging schemes. The report surveys the existing state of the art in LSI along different dimensions. The topics include: The circuit technology (RTL, DTL, TTL, etc.); The manufacturing techniques for bipolar devices (Collector Diffused Isolation, Isoplanar techniques, etc) and MOS devices (PNOS, Sigate, Moly-gae, etc), Interconnection schemes for customizing circuits (discretionary wiring, micromatrix, polycell, etc.), Packaging techniques from the viewpoint of hemiticity, pin count, reliability, etc; Logic functions, especially Semiconductor memory arrays which form a very important application of LSI, are discussed together with some forecasting on price and volume; The implication of LSIO on large modular system design.
(Modified Author Abstract) GRA

N73-30896 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF MICROELECTRONICS
Andrzej Ambroziak *In its* Transl. on Eastern Europe, Sci. Affairs, No. 339 (JPRS-59617) 25 Jul. 1973 p 22-23 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 21-28 (For availability see N73-30893 21-34)

N73-30897 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF SOLID STATE MICROWAVE ELECTRONICS
Adam Smolinski *In its* Transl. on Eastern Europe, Sci. Affairs, No. 339 (JPRS-59617) 25 Jul. 1973 p 24-28 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 28-32 (For availability see N73-30893 21-34)

N73-30899 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF ELECTRON TUBES
Jan Hennel *In its* Transl. on Eastern Europe, Sci. Affairs, No. 339 (JPRS-59617) 25 Jul. 1973 p 36-37 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 44-47 (For availability see N73-30893 21-34)

N73-30900 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF MICROWAVE TUBES
Lech Sokolowski *In its* Transl. on Eastern Europe, Sci. Affairs, No. 339 (JPRS-59617) 25 Jul. 1973 p 38-40 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 47-50 (For availability see N73-30893 21-34)

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N73-30213# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.
DEVELOPMENT OF CHEMICAL COATING FOR AIRFIELD RUNWAY MARKING Final Report
Stanley P. Dowdy Washington FAA Feb. 1973 59 p refs
(Contract DOT-FA69WAI-154)

(FAA-RD-73-23) Avail: NTIS HC $5.00

An airfield runway marking paint superior to paint and/or systems presently utilized was developed. A high-molecular weight, linear bisphenol polyether was developed. Methyl ethyl ketone as a pure solvent was found to be the most effective in producing rapid completely dry, flexible paint that is practically nonreactive with the substrates and conform to pollution requirements of Los Angeles (Rule 66). Three different anti-skid additives were studied as well as a water resistant (silicone) additive to improve bead retention and adhesion of the coating to the substrate. A styrene acrylate and a chlorinated rubber alkyd were evaluated. Field tests were conducted. A proposed specification for the procurement of the desired paint was developed. Author

N73-30214*# National Academy of Public Administration, Washington, D.C.

THE ADMINISTRATION OF THE NASA SPACE TRACKING SYSTEM AND THE NASA SPACE TRACKING SYSTEM IN AUSTRALIA

Neil Hollander 31 Jan. 1973 92 p refs

(Contract NSR-09-046-001)

(NASA-CR-133828) Avail: NTIS HC $6.75 CSCL 14B

The international activities of the NASA space program were studied with emphasis on the development and maintenance of tracking stations in Australia. The history and administration of the tracking organization and the manning policies for the stations are discussed, and factors affecting station operation are appraised. A field study of the Australian tracking network is included. F.O.S.

N73-30215# Federal Aviation Administration, Washington, D.C. Office of Systems Engineering Management.

ENGINEERING AND DEVELOPMENT PROGRAM PLAN: TERMINAL/TOWER CONTROL Interim Report

Apr. 1973 151 p

(FAA-ED-14-2) Avail: NTIS HC $9.75

The FAA engineering and development program 14 terminal/tower control is presented. It provides the definition of the development program for the terminal air traffic control portion of the third and upgraded third generation of the National Airspace System. The product of this development program is terminal ATC improvements, which, if implemented, satisfy stated requisites. The plan defines the goals, general approach, development activities, schedules and resource requirements for the development program. The following topics are discussed: background and general requirements, purpose, scope, objectives, factors influencing terminal/tower system configurations and program development, structure and allocation of technical efforts, and implementation considerations. Author

N73-30216# Technology, Inc., San Antonio, Tex. Life Sciences Div.

DEVELOPMENT OF VISUAL AIDS TO ALLEVIATE SPATIAL DISORIENTATION DURING TAKEOFF AND LANDING Final Report

W. H. Bowie, S. C. Collyer, and D. S. Stolarski Washington FAA Jun. 1973 48 p refs

(Contract DOT-FA72WA-2760)

(FAA-RD-73-26) Avail: NTIS HC $4.50

The concept for a ground based visual aid to help alleviate spatial disorientation during takeoff and landing approaches was developed. The proposed device consists of a 2/3 mile diameter circle of 12 lights mounted at least 2 miles from the end of the runway. This array has the appearance of a flat ellipse during most of the departure phase of flight. However, the array's usefulness deteriorates as the pilot approaches a distance of 1/2 mile from the array. The relative degree of spatial disorientation hazard associated with a particular runway was researched. A device was designed and built with which to assess such hazards. The device is designated a visibility meter. In addition, a tentative design for visibility markers to aid in determining horizontal visibility was proposed. Author

N73-30217*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

THE JET PROPULSION LABORATORY 7.62-m SPACE SIMULATOR MODIFICATION

Norman R. Morgan 1 Sep. 1973 43 p refs

(Contract NAS7-100)

(NASA-CR-133791; JPL-TM-33-639) Avail: NTIS HC $4.25 CSCL 14B

The JPL 7.62-m space simulator was modified to simulate the solar intensities at the planet Mercury. The capability of the simulator was increased to support testing of both the Mariner spacecraft mission to Venus and Mercury (to be launched in 1973) and the Helios spacecraft. The design of the off-axis reflecting system of the JPL simulators allowed attaining increased solar intensity, at the expense of test area, by placing a smaller collimating mirror at a lower elevation in the space simulator. In addition to requiring a new collimating mirror 4.57-m in diameter, the optical integrating system required a new design and there were several other efforts necessary to support these primary alterations. Author

N73-30218*# LTV Aerospace Corp., Dallas, Tex. Vought System Div.

EXTRAVEHICULAR MOBILITY UNIT THERMAL SIMULATOR Final Report

C. W. Hixon and M. A. Phillips 31 Jul. 1973 189 p refs

(Contract NAS9-7644)

(NASA-CR-134005; T155-03) Avail: NTIS HC $11.50 CSCL 14B

The analytical methods, thermal model, and user's instructions for the SIM bay extravehicular mobility unit (EMU) routine are presented. This digital computer program was developed for detailed thermal performance predictions of the crewman performing a command module extravehicular activity during transearth coast. It accounts for conductive, convective, and radiative heat transfer as well as fluid flow and associated flow control components. The program is a derivative of the Apollo lunar surface EMU digital simulator. It has the operational flexibility to accept card or magnetic tape for both the input data and program logic. Output can be tabular and/or plotted and the mission simulation can be stopped and restarted at the discretion of the user. The program was developed for the NASA-JSC Univac 1108 computer system and several of the capabilities represent utilization of unique features of that system. Analytical methods used in the computer routine are based on finite difference approximations to differential heat and mass balance equations which account for temperature or time dependent thermo-physical properties. Author

N73-30219*# LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.

EXTRAVEHICULAR MOBILITY UNIT THERMAL SIMULATOR FOR J MISSION

C. W. Hixon and M. A. Phillips 31 Jul. 1973 123 p refs

(Contract NAS9-7644)

(NASA-CR-134006; T155-04) Avail: NTIS HC $8.25 CSCL 14B

For abstract, see N73-30218.

N73-30220*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

THE V-3 CONTAMINATION TEST OF THE CHAMBER A FACILITY AND A SUBSEQUENT CRYOGENIC/VACUUM STUDY OF THE V-3 TEST QUARTZ CRYSTAL MICROBALANCE

W. Walding Moore, Jr. and Philip W. Tashbar 30 Mar. 1973 45 p refs

(NASA-TM-X-64776) Avail: NTIS HC $4.25 CSCL 14B

The areas of orbital and ground contamination of flight experiment hardware have been well established. This report relates directly to results of vacuum chamber testing for the ground evaluation of flight experiment hardware performance. First, the data obtained during the V-3 contamination testing in the Johnson Space Center's Chamber A space simulation test facility are presented. Second, during the V-3 contamination tests, the MSFC Space Sciences Laboratory's quartz crystal microbalance exhibited two periods of anomalous readings. Therefore, a subsequent small chamber tests was conducted in a controlled cryogenic/vacuum environment. The objective was to reproduce with known parameters the anomalous behavior patterns of the V-3 test data. Analyses of the anomalous readings are made on the basis of these tests. Additionally, as a by-product of the small chamber tests, calibration curves then existing for the quartz

crystal microbalance were empirically extended, and certain data-formatting aids were documented. Author

N73-30221*# McDonnell-Douglas Electronics Co., St. Charles, Mo.
SPACE SHUTTLE VISUAL SIMULATION SYSTEM DESIGN STUDY
20 Jul. 1973 112 p
(Contract NAS9-12651)
(NASA-CR-134020; MSC-06741) Avail: NTIS HC $7.75 CSCL 14B

A recommendation and a specification for the visual simulation system design for the space shuttle mission simulator are presented. A recommended visual system is described which most nearly meets the visual design requirements. The cost analysis of the recommended system covering design, development, manufacturing, and installation is reported. Four alternate systems are analyzed. Author

N73-30222*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
SMITHSONIAN ASTROPHYSICAL OBSERVATORY REFERENCE SYSTEM BULLETIN, NO. 1
Feb. 1973 28 p refs
(Grant NGR-09-015-002)
(NASA-CR-133829; Rept-301-056) Avail: NTIS HC $3.50 CSCL 14B

The reference system is described which involves timing, scale, coordinate systems and their transformations, and observations of the rotation of the earth. Timing (epochs) and STADAT timing corrections are discussed. The coordinates for locations, and MSL height are listed for each observing station. F.O.S.

N73-30223# Maryland Univ., College Park. Dept. of Physics and Astronomy.
WIDE GAP SPARK CHAMBER SYSTEM FOR NAL EXPERIMENT 2-B
F. Svrcek, ed. and G. Zorn, ed. Feb. 1973 56 p Sponsored by AEC
(ORO-2504-202; TR-73-091) Avail: NTIS HC $5.00

The bubble chamber-spark chamber hybrid system currently in operation for NAL experiment 2-B is described. The widegap spark chambers are discussed primarily. Topics include: the physical arrangement; spark chamber enclosure and contents; counters and fast logic used in triggering system; slow logic to control the high-voltage switches, data box, fiducials, and cameras; monitors available for the system; and gas systems including the spark chamber gas system and the nitrogen gas system for the Marx generators. NSA

N73-30224# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Angewandte Gasdynamik.
DEVELOPMENT AND TESTS OF A PROTOTYPE AERODYNAMIC FREE FLIGHT MEASUREMENT SYSTEM FOR GUN TUNNELS [PROTOTYPENENTWICKLUNG UND -ERPROBUNG EINES AERODYNAMISCHEN FREIFLUGMESSYSTEMS FUER DEN GUN TUNNEL]
Guenter Requart and Hans-Peter Kabelitz 5 Jul. 1972 58 p refs In GERMAN; ENGLISH summary
(DLR-FB-72-41) Avail: NTIS HC $5.00; DFVLR, Porz, West Ger. 18,20 DM

The measurements of aerodynamic forces of space shuttle and reentry vehicles in hypersonic facilities often becomes difficult and imprecise. Design criteria for a free flight testing system were derived and applied to the selection of system and system components. A magnetic model suspension device was constructed and optimized with respect to the requirements of gun tunnel operation. Furthermore a tracing system based on pulsed light beam emission from and on RF energy transmission to the free flight test model was developed. Several problems of tracing system performance were investigated and solved. ESRO

N73-30225# European Space Research and Technology Center, Noordwijk (Netherlands).
MEASUREMENT OF THE ULTRAVIOLET RADIATION FLUX EMITTED BY A SOLAR SIMULATOR [MESURE DU FLUX DU RAYONNEMENT ULTRAVIOLET EMIS PAR UN SIMULATEUR SOLAIRE]
F. Levadou and C. F. Minier Paris ESRO Jan. 1973 13 p In FRENCH; ENGLISH summary
(ESRO-TM-149-ESTEC) Avail: NTIS HC $3.00

A method which enables the spectral intensity, energy, and variation of the ultraviolet radiation flux emitted by a solar simulator to be measured is presented. The equipment used consists mainly of a thermopile and a spectrometer. Author (ESRO)

N73-30226# Naval Postgraduate School, Monterey, Calif.
MODEL TEST OF A TURBO-TYPE ENERGY ABSORBER FOR AIRCRAFT CARRIER ARRESTING GEAR M.S. Thesis
Thomas Albert Morgenfeld Mar. 1973 80 p refs
(AD-761502) Avail: NTIS CSCL 01/5

Increasing energy absorption requirements are being placed on present day aircraft carrier arresting gear engines. Hydraulic ram type engines have reached the upper limit of their development due to weight and space limitations. A turbo-type energy absorber has been proposed as an alternative. The Naval Air Engineering Center is currently developing such a machine. Theoretical analyses have determined the absorber to be practical. This study involves the testing of a flow model of that absorber with the objective to verify loss coefficients and check for flow separation in the passages. (Modified author abstract) GRA

N73-30227# General Dynamics/Convair, San Diego, Calif. Aerospace Div.
WIND TUNNEL MODEL PARAMETRIC STUDY FOR USE IN THE PROPOSED 8 ft x 10 ft HIGH REYNOLDS NUMBER TRANSONIC WIND TUNNEL (HIRT) AT ARNOLD ENGINEERING DEVELOPMENT CENTER Final Report, Jun. - Dec. 1972
Walter K. Alexander, Stanley A. Griffin, and Robert L. Holt Mar. 1973 196 p refs
(Contract F40600-72-C-0015)
(AD-763725; GDCA-DHJ-72-001; AEDC-TR-73-47) Avail: NTIS CSCL 14/2

The need for a high Reynolds number transonic wind tunnel (HIRT) has been recognized throughout the industry for some years. The proposed HIRT facility at Arnold Engineering Development Center will provide a much needed tool for the study of phenomena sensitive to Reynolds number. The usefulness of the HIRT facility will be largely influenced by the ability of industry to design and build wind-tunnel models for an acceptable cost capable of operating within the severe environment of the tunnel. The object of this study is to determine the feasibility of designing and building models capable of withstanding the loads and environmental conditions of the facility. The aircraft configurations chosen for study cover a wide spectrum of flight conditions. (Modified author abstract) GRA

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N73-30228 California Inst. of Tech., Pasadena.
AN INVESTIGATION OF SHOCK STRENGTHENING IN A CONICAL, CONVERGENT CHANNEL, PART 1. SPECTROSCOPIC INVESTIGATION OF STRONG SHOCKWAVES IN A CONICAL, CONVERGENT CHANNEL, PART 2 Ph.D. Thesis
Erik Storm 1973 174 p
Avail: Univ. Microfilms. Order No. 73-7300

The behavior of an initially plane, strong shock wave propagating into a conical convergence is investigated experimentally and theoretically. In the experiment a 10 half-angle cone is mounted on the end of a pressure-driven shock tube. Shock waves with initial Mach numbers varying from 6.0 to 10.2 are generated in argon at a pressure of 1.5 torr. During each run local shock velocities at several positions along the cone axis are measured using a thin, multi-crystal piezoelectric probe inserted

from the vertex. This technique produces accurate velocity data for both the incident and reflected shock waves. In the corresponding analysis, a simplified characteristics method is used to obtain an approximate solution of the axisymmetric diffraction equations. Dissert. Abstr.

N73-30229# Aeronautical Research Labs., Melbourne (Australia).

FLOW VISUALISATION USING THE HYDROGEN BUBBLE TECHNIQUE

D. H. Thompson Feb. 1973 50 p refs

(ARL/A-Note-338) Avail: NTIS HC $4.50

The application of the hydrogen bubble flow visualisation technique to the study of aerodynamic problems in water flow facilities is described. The effects of water chemical composition, water temperature, and electrode size and spacing on bubble production are described. The influence of bubble buoyancy on bubble formation and flow path distortion is discussed. Lighting and photographic techniques are outlined and examples are given of visualisation of two-and three-dimensional flows. Author

N73-30230# Aeronautical Research Labs., Melbourne (Australia).

THE USE OF DYES FOR WATER TUNNEL FLOW VISUALISATION

D. H. Thompson Feb. 1973 29 p refs Original contains color illustrations

(ARL/A-Note-339) Avail: NTIS HC $3.50

The use of dye flow visualisation techniques in a small water tunnel is described. The methods of dye injection, the types of dye used, the problems of illumination and photography, and the interpretation of flow patterns are discussed. The discussion is illustrated with examples of flow patterns, mainly those around slender delta wings. Author

N73-30231*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A MODEL FOR THE PRESSURE EXCITATION SPECTRUM AND ACOUSTIC IMPEDANCE OF SOUND ABSORBERS IN THE PRESENCE OF GRAZING FLOW

Edward J. Rice 1973 11 p refs Proposed for presentation at Aero-Acoustics Conf., Seattle, Wash., 15-17 Oct. 1973; sponsored by AIAA

(NASA-TM-X-71418; E-7656) Avail: NTIS HC $3.00 CSCL 20D

The acoustic impedance of sound absorbers in the presence of grazing flow is essential information when analyzing sound propagation within ducts. A unification of the theory of the nonlinear acoustic resistance of Helmholtz resonators including grazing flow is presented. The nonlinear resistance due to grazing flow is considered to be caused by an exciting pressure spectrum produced by the interaction of the grazing flow and the jets flowing from the resonator orifices. With this exciting pressure spectrum the resonator can be treated in the same manner as a resonator without grazing flow but with an exciting acoustic spectrum. Author

N73-30232*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

A STUDY OF THE EFFECT OF A BOUNDARY LAYER PROFILE ON THE DYNAMIC RESPONSE AND ACOUSTIC RADIATION OF FLAT PANELS Ph.D. Thesis - Virginia Univ.

John Scott Mixson Jun. 1973 132 p refs

(NASA-TM-X-69568) Avail: NTIS HC $8.75 CSCL 20D

The response of a thin, elastic plate to a harmonic force which drives the plate from below and a compressible air stream with a viscous boundary layer flowing parallel to the upper surface along the length was investigated. Equations governing the forced response of the coupled plate-aerodynamic system are derived along with appropriate boundary conditions. Calculations of basic solution parameters for a linear velocity profile and for a Blasius profile showed that the same system response could be obtained from each profile if appropriate values of boundary layer thickness were chosen for each profile. Author

N73-30233*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

AN INVESTIGATION OF A FREE JET AT LOW REYNOLDS NUMBERS M.S. Thesis - Old Dominion Univ.

George C. Greene Aug. 1973 42 p refs

(NASA-TM-X-69566) Avail: NTIS HC $4.25 CSCL 20D

A comparison of the measured and calculated flow field properties of a nozzle of unusual design which was used to produce an incompressible, low Reynolds number jet is presented. The nozzle is essentially a porous metal plate which covers the end of a pipe. Results are presented for nozzle Reynolds numbers from 50 to 1000 with velocities of 100 or 200 ft/sec. The nozzle produces a uniform velocity profile at nozzle Reynolds numbers well below those at which conventional contoured nozzles are completely filled with the boundary layer. A jet mixing analysis based on the boundary layer equations accurately predicted the flow field over the entire range of Reynolds numbers tested. Author

N73-30234# Grumman Aerospace Corp., Bethpage, N.Y. Aerophysics.

SOME PRELIMINARY RESULTS OF THE NUMERICAL COMPUTATION OF TWO CLASSES OF TRANSONIC INTERACTION PROBLEMS

Bernard Grossman and Robert E. Melnik Aug. 1973 17 p refs

(RM-577) Avail: NTIS HC $3.00

The inviscid transonic flow over a body with a supersonic underexpanded exhaust plume and the viscous subsonic-transonic flow in the vicinity of boattail-sting are discussed. Numerical solutions are obtained using a relaxation procedure for the inviscid transonic flow, a supersonic marching technique for the jet flow field, and Bradshaw's method for the turbulent boundary layer. The interaction is handled iteratively. Several preliminary numerical results are presented. Author

N73-30235*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A REVERSE SHOCK ASSOCIATED WITH A STREAM-STREAM INTERACTION: THE 29TH FEBRUARY 1968 EVENT

J. K. Chao (Maryland Univ., College Park), R. P. Lepping (MIT, Cambridge), and J. Binsack Aug. 1973 24 p refs

(NASA-TM-X-70451; X-692-73-246) Avail: NTIS HC $3.25 CSCL 20D

A clearly defined perpendicular fast reverse shock was found in the interplanetary plasma and magnetic field data from Explorers 33 and 35. An observation by Pioneer 8, which is not unambiguously identifiable because of insufficient data, indicates the evolution of this event. It is suggested that this reverse shock was formed from a stream-stream interaction and that an associated foward shock was developing and probably formed beyond the earth's orbit. Author

N73-30236# National Aerospace Lab., Tokyo (Japan).

A DESCRIPTION OF THE IDEAS UNDERLYING A COMPUTER PROGRAM FOR PREDICTING THE AEROFOIL PRESSURE DISTRIBUTIONS IN SUB-CRITICAL VISCOUS FLOW

Masao Ebihara, Youji Ishida, and Tokio Okonogi 1971 18 p refs In JAPANESE; ENGLISH summary

(NAL-TR-248) Avail: NTIS HC $3.00

A computer program for determining the airfoil pressure distribution for subcritical attached viscous flow was developed. The calculation is based on a compressibility correction for the boundary layer camber model to account for viscous effects. The process by which the modification is accomplished is explained and the limitation of the boundary layer camber model is discussed. Comparisons between theoretical and experimental results are submitted. Author

N73-30237# Specola Vaticana (Vatican City).

NOTE ON VARIATIONAL PRINCIPLES GOVERNING SMALL DEPARTURES FROM EQUILIBRIUM IN GASEOUS SPHERES AND IN HORIZONTAL FLUIDS

P. Smeyers 1973 9 p refs

Avail: NTIS HC $3.00

The analogy is presented between a variational principle of Chandrasekhar and Lebovitz governing adiabatic radial and nonradial oscillations of a gaseous sphere, and a variational

principle of Tolstoy governing waves in stratified horizontal fluids. Author

N73-30238# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace Engineering.
VECTORED INJECTION INTO NON-ADIABATIC BOUNDARY LAYER FLOWS INCLUDING INCIPIENT SEPARATION
G. R. Inger and T. F. Swean, Jr. Jun. 1973 96 p refs
(Grant NSF GK-20379)
(VPI-Aero-003) Avail: NTIS HC $7.00

A basic theoretical investigation of self-similar isobaric boundary layer solutions is presented for a wide range of normal and tangential surface mass transfer velocities including the effects of heat transfer. A new set of double-valued solutions pertaining to the case of small-to-moderate upstream vectoring is identified and studied. Also, the frictional heating associated with vectoring is shown to have a significant effect on the heat transfer and recovery factor for high speed flows. Detailed results are also presented for skin friction, velocity and enthalpy profiles, and momentum and displacement thickness integral properties. Author

N73-30239# Texas Univ., Austin. Coll. of Engineering.
SURFACE BOUNDARY LAYER TEMPERATURE PROFILES AND TURBULENT HEAT FLUX DURING ONSHORE FLOW
Huei-lin Lu Aug. 1973 54 p refs
(Grant NSF GA-16167)
(Rept-38) Avail: NTIS HC $4.75 CSCL 20D

Boundary layer temperature and wind profile observations obtained from a 32 meter tower and a captive balloon 90 meters inland on the upper Texas coast on 14 and 16 June 1968 are used to analyze the effect of an abrupt change in surface roughness and surface temperature on the development of an internal boundary layer during onshore winds. The top of the thermal internal boundary layer was observed to coincide with the mechanical internal boundary layer observed from wind profiles at the same site by Echols in 1970. The average thickness of the internal boundary layer was found to be near 7 meters, increasing in depth with increasing thermal instability below the internal boundary. Utilizing similarity theory, heat flux at the beach site was calculated from the temperature and wind profiles. Author

N73-30240*# Pennsylvania State Univ., University Park. Dept. of Aerospace Engineering.
INVESTIGATION OF BOUNDARY LAYER AND TURBULENCE CHARACTERISTICS INSIDE THE PASSAGES OF AN AXIAL FLOW INDUCER
A. Anand, C. Gorton, B. Lakshminarayana, and H. Yamaoka Jul. 1973 220 p refs
(Grant NGL-39-009-007)
(NASA-CR-121248; PSU-AERSP-73-9) Avail: NTIS HC $13.00 CSCL 20D

A study of the boundary layer and turbulence characteristics inside the passages of an axial flow inducer is reported. The first part deals with the analytical and experimental investigation of the boundary layer characteristics in a four bladed flat plate inducer passage operated with no throttle. An approximate analysis for the prediction of radial and chordwise velocity profiles across the passage is carried out. The momentum integral technique is used to predict the gross properties of the boundary layer. Equations are given for the exact analysis of the turbulent boundary layer characteristics using the turbulent field method. Detailed measurement of boundary layer profiles, limiting streamline angle and skin friction stress on the rotating blade is also reported. Part two of this report deals with the prediction of the flow as well as blade static pressure measurements in a three bladed inducer with cambered blades operated at a flow coefficient of 0.065. In addition, the mean velocity and turbulence measurements carried out inside the passage using a rotating triaxial probe is reported. Author

N73-30241*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EXPERIMENTAL EVALUATION OF FLUCTUATING DENSITY AND RADIATED NOISE FROM A HIGH TEMPERATURE JET
P. F. Massier, S. P. Parthasarathy, and R. F. Cuffel 1 Oct. 1973 29 p refs Presented at the AGARD Fluid Dyn. Panel Meeting, Brussels, 19-21 Sep. 1973
(Contract NAS7-100)
(NASA-CR-133789; JPL-TM-33-643) Avail: NTIS HC $3.50 CSCL 20D

An experimental investigation has been conducted to characterize the fluctuating density within a high-temperature (1100 K) subsonic jet and to characterize by the noise radiated to the surroundings. Cross correlations obtained by introducing time delay to the signals detected from spatially separated crossed laser beams set up as a Schlieren system were used to determine radial and axial distributions of the convection velocity of the moving noise sources (eddies). In addition, the autocorrelation of the fluctuating density was evaluated in the moving frame of reference of the eddies. Also, the autocorrelation of the radiated noise in the moving reference frame was evaluated from cross correlations by introducing time delay to the signals detected by spatially separated pairs of microphones. Radial distributions of the mean velocity were obtained from measurements of the stagnation temperature, and stagnation and static pressures with the use of probes. Author

N73-30242*# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
ANALYSIS OF A TWO-DIMENSIONAL TYPE 6 SHOCK-INTERFERENCE PATTERN USING A PERFECT-GAS CODE AND A REAL-GAS CODE
John J. Bertin and Bruce W. Graumann Aug. 1973 138 p
(Contract NAS9-10976)
(NASA-CR-134010; Rept-73003) Avail: NTIS HC $9.00 CSCL 20D

Numerical codes were developed to calculate the two dimensional flow field which results when supersonic flow encounters double wedge configurations whose angles are such that a type 4 pattern occurs. The flow field model included the shock interaction phenomena for a delta wing orbiter. Two numerical codes were developed, one which used the perfect gas relations and a second which incorporated a Mollier table to define equilibrium air properties. The two codes were used to generate theoretical surface pressure and heat transfer distributions for velocities from 3,821 feet per second to an entry condition of 25,000 feet per second. Author

N73-30243*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LOADING AND HEATING OF A LARGE FLAT PLATE AT MACH 7 IN THE LANGLEY 8-FOOT HIGH-TEMPERATURE STRUCTURES TUNNEL
William D. Deveikis and L. Roane Hunt Washington Sep. 1973 67 p refs
(NASA-TN-D-7275; L-8760) Avail: NTIS HC $3.50 CSCL 20D

Surface pressure and cold-wall heating rate distributions (wall-temperature to total-temperature ratio approximately 0.2) were obtained on a large, flat calibration panel at a nominal Mach number of 7 in an 8-foot high-temperature structures tunnel. Panel dimensions were 42.5 by 60.0 in. Test objectives were: (1) to map available flat-plate loading and heating provided by the facility and (2) to determine effectiveness of leading-edge bluntness, boundary-layer trips, and aerodynamic fences in generating a uniform, streamwise turbulent flow field over the test surface of a flat-sided panel holder. Author

N73-30244*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LASER DOPPLER VELOCIMETER INVESTIGATION OF TRAILING VORTICES BEHIND A SEMI-SPAN SWEPT WING IN A LANDING CONFIGURATION
D. L. Ciffone, K. L. Orloff, and G. R. Grant Aug. 1973 45 p refs
(NASA-TM-X-62294) Avail: NTIS HC $4.25 CSCL 20D

Measured axial and tangential velocity profiles in the near wake vortices of a semi-span model of the Convair 990 wing in the NASA-Ames 7- by 10-foot wind tunnel are presented. A scanning laser Doppler velocimeter was used to obtain data at two different downstream stations (0.49 and 1.25 wing spans) at various angles of attack and configurations from wing alone

to wing plus nacelles, anti-shock bodies, and flaps deflected 27 deg (landing configuration). It is shown that the velocity distributions within the wake are quite sensitive to span loading. Specifically, it is illustrated that an aircraft flying at given lift coefficient (C SUB L), can substantially reduce its trailing vortex upset potential by deploying its flaps and altering its flight attitude to maintain the same C SUB L. This might be taken into consideration along with performance and noise considerations in the selection of aircraft approach lift over drag. Author

N73-30245# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Lampoldshausen (West Germany). Inst. fuer Chemische Raketenantriebe.

FLOW-RATE MEASUREMENTS WITH CAVITATING VENTURI TUBES

Juergen Broschk 5 May 1972 56 p refs In GERMAN; ENGLISH summary

(DLR-FB-72-33) Avail: NTIS HC $5.00; DFVLR, Porz, West Ger. 17,60 DM

Theoretical and experimental investigations were carried out to determine the mass flow of fluids with cavitating Venturi tubes. The mechanism of cavitation, some parameters of influence and their consequences are explained. It was found that not all effects arising during the cavitation process are clearly settled. Some considerations about the theory of cavitating Venturi tubes may explain the principle, the sort of procedure and the possibilities of application concerning this device. Experimental investigations with several fluids demonstrated the possibility of determining the mass flow of rocket propellants by using pressure measure ments on condition that the cavitating Venturi tubes are adjusted to the desired flow range. Author (ESRO)

N73-30246# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Aachen (West Germany). Inst. fuer Theoretische Gasdynamik.

PROPAGATION OF PLANE PRESSURE WAVES THROUGH A MOVABLE WALL Ph.D. Thesis - Aachen Univ. [DIE FORTPFLANZUNG EBENER DRUCKWELLEN DURCH EINE BEWEGLICHE WAND]

Horst-Friedrich Schwarze 23 Aug. 1972 67 p refs In GERMAN; ENGLISH summary

(DLR-FB-72-59) Avail: NTIS HC $5.50; DFVLR, Porz, West Ger. 19,10 DM

The reflection of a weak plane pressure-wave on a movable wall causes the wall to deviate from its neutral position. Also, the state of the gas behind the wall is disturbed. The flow field behind the wall depends on the shape and strength of the incoming pressure wave, the states of the gases on both sides of the wall, the wall mass, and the resisting forces acting on the wall. It is examined by means of an analytical method of characteristics. The procedure is modified to determine the shocks numerically. For the special case of calculating the first shock running into the undisturbed flow field, an analytical solution is given.

Author (ESRO)

N73-30247# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Luftstrahlantriebe.

A METHOD OF CHARACTERISTICS FOR THREE-DIMENSIONAL, STEADY SUPERSONIC FLOW IN ROTATING AND STATIONARY ANNULAR CASCADES Ph.D. Thesis - Aachen Univ. [EIN CHARAKTERISTIKENVERFAHREN FUER DIE DREIDIMENSIONALE, STATIONAERE UEBERSCHALLSTROEMUNG IN ROTIERENDEN UND FESTSTEHENDEN RINGGITTERN]

Hans Heiner Fruehauf 1973 97 p refs In GERMAN; ENGLISH summary

(DLR-FB-73-12) Avail: NTIS HC $7.00; DFVLR, Porz, West Ger. 32, 10 DM

The steady, continuous supersonic flow in rotating respectively stationary annular cascades is treated by a nonlinear, stable method of characteristics in three independent variables. The quasi-linear differential equations of the flow are transformed to arbitrary, curvilinear coordinates, before being reduced to a characteristics form. The mathematical description of the spatial, oblique-angled characteristic net in annular cascades with arbitrary, smooth boundaries becomes simple. Numerical examples indicate three-dimensional effects which cannot be determined using quasi-three-dimensional approximation methods. The quantitative difference between an approximate solution and the exact, three-dimensional solution is presented in the case of a particular rotating cascade. Author (ESRO)

N73-30248# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Dynamik Verduennter Gase.

DRAG MEASUREMENTS ON PLATES IN PARALLEL FLOW AND DISCS IN PERPENDICULAR FLOW IN SUPERSONIC HIGHLY RAREFIED FREE JETS Ph.D. Thesis - Goettingen Univ., West Ger.

H. Legge 1973 107 p refs In GERMAN; ENGLISH summary

(DLR-FB-73-17; AVA-FB-7225) Avail: NTIS HC $7.50; DFVLR, Porz, West Ger. 33,30 DM

Drag measurements on a parallel flat plate and a perpendicular disk were carried out in hypersonic low density facilities. The flow field of a free jet at low densities, especially the influence of the background molecules and the freezing effects, on the drag are examined by measurements on parallel flat plates in free molecular flow. The experiments are compared with theoretical studies. The drag coefficient of a perpendicular disk is measured in the whole range from free molecular to continuum flow. This is achieved by measurements in a low density free jet, an isentropic free jet, and a conical nozzle flow. General conclusions on drag measurements in low density free jets are drawn.

Author (ESRO)

N73-30249# Defence Research Information Centre, Orpington (England).

EXPERIMENTAL STUDIES OF THE HYDRODYNAMIC FORCES AND MOMENTS ACTING ON ONE BLADE OF A SHIP'S PROPELLER AT AN OBLIQUE ANGLE OF FLOW

K. Meyne, A. Nolte et al Jun. 1973 26 p refs Transl. into ENGLISH from Schiff und Hafen (Uetersen, West Ger.), v. 21, no. 5 May 1969 p 359-366

(DRIC-Trans-3205; BR30550) Avail: NTIS HC $3.50

The need for studies of propellers in oblique flow is discussed. A 4-bladed model propeller was studied in a large cavitation tunnel in axial flow and also in oblique flow by inclining the shaft up to 12 deg relative to the axis of the tunnel. Propeller thrust and torque, the transverse force, and the forces on an individual blade of a 4-bladed propeller were measured over a large range of speeds of advance at two pitch ratios. The construction of the measuring arrangement, the results in diagrammatic form, pictures of the formation of vacitation, and some pen recordings are shown. Mean thrust and mean torque are greater in oblique flow as the angle of inclination is increased and as speed of advance is increased than in axial flow. The forces on an individual blade are insignificantly smaller when cavitation takes place. Author (ESRO)

N73-30250# Naval Ordnance Lab., White Oak, Md.

AN INVESTIGATION OF THE USE OF HOLOGRAPHY IN STUDYING SUPERSONIC FLOW IN INLETS

W. C. Spring, III and W. C. Ragsdale 20 Apr. 1973 29 p refs

(AD-763335; NOLTR-73-80) Avail: NTIS CSCL 20/4

Experiments have investigated the usefulness of holographic interferometry as a flow visualization technique for studying supersonic flow in air inlets. A bench-scale two-dimensional supersonic (Mach 3) nozzle diffuser with plexiglass sidewalls was used to simulate inlet flow phenomena. One series of tests was performed with a rectangular tab of metal on the bottom wall of the channel to cause boundary-layer separation. A second series was run with a cone model mounted in the center of the channel. A real image technique of reconstruction was used to obtain photographs of the holographic interferograms from each test series. (Modified author abstract) GRA

N73-30251# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STUDY OF FLOW CHARACTERISTICS BEHIND DIFFUSERS WITH LARGE ANGLES OF FLARE

B. V. Belyanin, A. M. Kharitonov, and D. V. Chusov 16 Jun. 1973 12 p refs Transl. into ENGLISH from Izv. Sibirsk. Otd. Akad. Nauk SSSR, Ser. Tekhn. Nauk (Novosibirsk), no. 8, Jun.

1972
(AD-763257; FTD-HT-23-586-73) Avail: NTIS CSCL 20/4

The attempt to obtain the most uniform flow possible in wind tunnels dictates the use of diffusers at the entrance to the precombustion chamber. Comparatively long diffusers with small angles of flare, 6-8 deg, are usually used. The use of diffusers with large angle of flare enables one to considerably reduce the length of the inlet contour of the tunnel, while the uniformity of the flow can be ensured by the same equalizing devices. GRA

N73-30252# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

AXIAL IMPACT OF A CYLINDRICAL SHELL ON THE SURFACE OF COMPRESSIBLE FLUID

A. Ya. Sagomonyan 7 Jun. 1973 16 p refs Transl. into ENGLISH from Vestin. Mosk. Univ., Ser. 1: Mat. i Mekhan. (Moscow), 1972 p 81-89
(AD-763259; FTD-HT-23-457-73) Avail: NTIS CSCL 20/4

The article considers the impact of a thin elastic shell of circular cross section, with a rigid flat leading edge and fluid filler, against the horizontal surface of a quiescent compressible fluid. The velocity of the impact is directed along the axis of the shell perpendicularly to the surface of the fluid. GRA

N73-30253# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SHOCK WAVE INTERACTION, SECTION 6

K. E. Gubkin 18 Jun. 1973 15 p Transl. into ENGLISH from the publ. "Mekhanika v SSSR za 50 Let, Volume 2" USSR, 1970 p 305-311
(AD-763157; FTD-HT-23-323-73) Avail: NTIS CSCL 20/4

Obstacles in the path of a shock wave which cause reflection and diffraction are discussed. The nature of the shock wave and its dependence on the angle of incidence and the amplitude of the shock wave are analyzed. A simple normal reflection theory is used to express the parameters of the reflected wave as a function of incidence angle and incident wave amplitude. Variations between theoretical and experimental results are explained.
P.N.F.

N73-30254# Ballistic Research Labs., Aberdeen Proving Ground, Md.

CALCULATIONS OF TURBULENT SHEAR STRESS IN SUPERSONIC TURBULENT BOUNDARY LAYER ZERO AND ADVERSE PRESSURE GRADIENT FLOW

Walter B. Sturek Jun. 1973 41 p refs
(DA Proj. 1T0-61102-A-33D)
(AD-763197; BRL-1651) Avail: NTIS CSCL 20/4

Calculations of turbulent shear stress distributions are reported for zero pressure gradient and adverse pressure gradient supersonic turbulent boundary layer flow. The calculations are accomplished by numerically integrating the equation for conservation of streamwise momentum using mean profile experimental data. The mixing length distributions were also determined and indicate that the mixing length distribution is significantly altered for the adverse pressure gradient flow. Finite difference boundary layer computations using an altered mixing length distribution show improved agreement with experimental measurements of skin friction for the adverse pressure gradient flow.
Author (GRA)

N73-30255# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

CALCULATION OF THE LAMINAR BOUNDARY LAYER ON A SLIPPING WING BY THE METHOD OF INTEGRAL RELATIONSHIPS

V. A. Barinov 18 Jun. 1973 14 p refs Transl. into ENGLISH from Uch. Zap. Tsagi (USSR), v. 3, no. 5, 1972 p 9-15
(AD-763285; FTD-HT-23-612-73) Avail: NTIS CSCL 20/4

A numerical method is described for the calculation of equations for an incompressible three-dimensional boundary layer on a slipping wing. It is a development of the method of integral relationships of A. A. Dorodnitsyn. Examples are given for the calculation of two flows - with suction of a gas across a surface and without suction. The results obtained using this method practically coincide with the results of calculation by the finite-difference method. GRA

N73-30256# Rockwell International Corp., Thousand Oaks, Calif. Science Center.

PRESSURE FIELDS OVER HYPERSONIC WING-BODIES AT MODERATE INCIDENCE Interim Report

N. Malmuth 26 Sep. 1972 44 p refs
(Contract F44620-71-C-0021; AF Proj. 9781)
(AD-763762; SCPP-72-89; AFOSR-73-1157TR) Avail: NTIS CSCL 20/4

Delta wings with conically subsonic cone-bodies mounted on their compressive side are analyzed in the hypersonic small disturbance regime. The weakly three dimensional conditions associated with slender parabolic Mach cones are used to validate a linearized rotational approximation of the flow field. A combined integral-series representation is obtained for the pressure distribution between the wing-body and shock wave for arbitrary body cross sections, and is specialized to give analytical formulae for arbitrary order polynomial transversal contours. Numerical results are presented for wedge, parabolic, and higher order cross sections illustrating the dominant character of the cross-flow stagnation singularity associated with sharp wing-body intersections having a finite slope discontinuity. (Modified author abstract) GRA

N73-30257# Naval Research Lab., Washington, D.C.

NUMERICAL MODEL FOR MIXED REGION COLLAPSE IN A STRATIFIED FLUID

J. P. Dugan, A. C. Warn-Varnas, and S. A. Placsek Jun. 1973 20 p refs
(ARPA Order 2152)
(AD-763657; NRL-MR-2597) Avail: NTIS CSCL 20/4

The collapse of a homogeneous fluid mass immersed in a stably stratified fluid is studied numerically. A finite difference formulation of the Navier-Stokes equations in the primitive variables is solved in a large box several times the size of the mixed region. The formulation conserves total energy in the box in the special case where the viscosity is zero. The shape of the homogeneous region and its energy content are followed in detail. Confirming a previous speculation made from a crude analytical theory, most of the energy in the homogeneous fluid mass is shown to be transferred to the exterior fluid in one Brunt-Vaisala period. The predictions agree with available analytical models in initial and intermediate stages and with a previous tank experiment in the intermediate and late stages of collapse. Author (GRA)

N73-30258# ARO, Inc., Arnold Air Force Station, Tenn.

NUMERICAL CALCULATION OF THE SUBSONIC AND TRANSONIC TURBULENT BOUNDARY LAYER ON AN INFINITE YAWED AIRFOIL Final Report, Apr. 1972 - Apr. 1973

AEDC Jul. 1973 110 p refs
(AD-763730; ARO-VKF-TR-73-52; AEDC-TR-73-112) Avail: NTIS CSCL 20/4

Formulation and application of a three-dimensional compressible turbulent boundary-layer analysis is presented for subsonic and transonic flow over a yawed airfoil of infinite extent. The governing turbulent boundary-layer equations are integrated using an implicit finite-difference procedure in conjunction with a scalar eddy viscosity model of three-dimensional turbulence. Comparisons with other analysis techniques as well as experimental measurements under subsonic wind tunnel conditions are presented to establish and ascertain the basic validity and applicability of the current technique. Also considered are the effects of a hot wall on the transonic, three-dimensional, turbulent boundary layer which have practical application to transonic space shuttle reentry. (Modified author abstract) GRA

N73-30259# Johns Hopkins Univ., Baltimore, Md.

SOME EXPERIMENTAL OBSERVATIONS OF UPSTREAM DISTURBANCES IN A TWO-FLUID SYSTEM

Robert R. Long Jul. 1973 16 p refs
(Contract N00014-67-A-0163-0013; NR Proj. 061-198)
(AD-763759; TR-3-Ser-C) Avail: NTIS CSCL 04/1

The paper is a brief report on some experimental measurements of flow of two-fluids over an obstacle in a channel. A comparison is made between theoretical predictions of upstream disturbances and measurements of the height and speed of the upstream jump and the depth of the lower fluid over the obstacle

crest. The results indicate substantial quantitative agreement between theory and observations when the lower fluid has a depth less than that of the upper fluid. When the lower fluid is deeper than the upper, the predicted upstream disturbance does not occur. Author (GRA)

N73-30260# California Inst. of Tech., Pasadena. Graduate Aeronautical Labs.

ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF A TURBULENT MIXING LAYER OF DIFFERENT GASES IN A PRESSURE GRADIENT

Manuel R. Rebollo Jun. 1973 151 p refs
(Contract N00014-67-A-0094-0001)
(AD-763487) Avail: NTIS CSCL 20/4

An analytical and experimental study was made of the turbulent mixing layer in adverse and zero pressure gradients. Theory predicts the possible existence of equilibrium flows, and this was confirmed experimentally for turbulent shear layers between streams of helium and nitrogen. The only case for which similarity is possible is described. The experimental investigation was conducted in a facility designed to produce turbulent flows at pressures up to 10 atmospheres. Adjustable walls of the test section of the apparatus were modified in order to set the pressure gradient. Shadowgraphs of the mixing zone for both types of gradient at different Reynolds numbers revealed a large scale structure noticeably different for each. The similarity properties of the shear layer were established from mean profiles of total head and density. (Modified author abstract) GRA

N73-30261# Naval Ship Research and Development Center, Bethesda, Md

SOME ENVIRONMENTAL EFFECTS ON HEADFORM CAVITATION INCEPTION

Terry Brockett Oct. 1972 91 p refs
(AD-763367; NSRDC-3974) Avail: NTIS CSCL 20/4

Cavitation-inception tests were performed on two headforms for which changes were made in the environment. Quantities which were varied, included type and amount of dissolved gas, chemical additives, time rate of change to cause inception, and temperature changes. Experimental procedure and relative air content had an appreciable effect on cavitation inception. Both headforms had the same designed minimum pressure coefficient; however, for one it was located 0.03 diam from the nose, and for the other, 0.73 diam. Inception was characterized by traveling bubbles on both headforms, with significant differences occurring in the bubble dynamics. Inception was determined visually and by counting occurrences. (Modified author abstract) GRA

N73-30262# Notre Dame Univ., Ind. Coll. of Engineering.

THE INTERACTION BETWEEN A HIGH VELOCITY VAPOR JET AND AN EXTERNAL COAXIAL COCURRENT WATER FLOW

Robert J. Young Jun. 1973 113 p refs
(Contract N00014-68-A-0152; NR Proj. 260-112)
(AD-763696; UND-73-6) Avail: NTIS CSCL 20/4

The work describes a correlation for heat transfer across the interface formed by a high speed steam jet in contact with and condensing into a cocurrent coaxial flow of subcooled water, where the heat transfer coefficient is directly related to the geometry of the stratified portion of the steam jet, and the characteristic velocity is that of the interfacial layer based on a Reynolds flux analysis. The net steam jet thrust is shown to agree well with values calculated by elementary nozzle theory. GRA

N73-30263# TRW Systems Group, Redondo Beach, Calif.

CAPILLARY FLOW THROUGH PARTIALLY SATURATED FIBROUS WICKS Final Report

James E. Eninger and Bruce D. Marcus 15 Jun. 1973 43 p refs
(Contract N00019-72-C-0340)
(AD-763427; TRW-21160-6005-RU-00) Avail: NTIS CSCL 20/4

Heat pipes are devices capable of transferring heat at a high rate between a thermal source and sink having only a small temperature difference between them. The crucial element of a heat pipe is the wick, through which condensed liquid from the cooler region returns to the hotter region under the action of capillary pressure. The purpose of the present work is to study, both theoretically and experimentally, flow through highly porous fibrous material, which is often used for heat-pipe wicks. Of particular concern is operation of wicks near their capillary limit where they are only partially saturated. GRA

N73-30264# California Univ., Los Angeles. School of Engineering and Applied Science.

STUDIES IN TRANSONIC FLOW. 1: TRANSONIC AREA RULE: BODIES

Julian D. Cole Aug. 1972 22 p refs
(Contract N00014-69-A-0200-4033)
(AD-763437; UCLA-ENG-7257) Avail: NTIS CSCL 20/4

The area rule is derived on the basis of the asymptotic transonic small-disturbance expansion for slender bodies. Matching of expansions valid in the near-field and the far-field is essential to the result. Some higher order terms in the near-field are calculated in order to apply the momentum theorem consistently. The results agree with those previously obtained that the overall drag is the same as that of a body of revolutions having the same distribution of cross-section area whenever either the body is effectively pointed at the tail; the streamwise rate of change of cross-section is zero at the tail. Author (GRA)

N73-30265# Lehigh Univ., Bethlehem, Pa. Dept. of Mechanical Engineering and Mechanics.

VISUALIZATION OF SECONDARY FLOWS IN PLANAR NOZZLES

J. A. Owczarek and A. N. Siddiqui May 1973 30 p refs
(Contract N00014-69-A-0417; Proj. Themis)
(AD-762743; TR-15) Avail: NTIS CSCL 20/4

A flow visualization study in planar nozzles having rectangular inlets from circular ducts produced clear photographs of secondary flows at nozzle exits. It also provided information on the effect of the Reynolds number on these secondary flows. Air was used as the flowing fluid and the flow field was visualized with the aid of smoke. (Modified author abstract) GRA

N73-30266# ARO, Inc., Arnold Air Force Station, Tenn.

EFFECTS OF CONDENSATION ON GAS VELOCITY IN A FREE JET EXPANSION Final Report, Apr. 1970 - Jul. 1972

A. B. Bailey AEDC Jun. 1973 36 p refs Sponsored by AEDC
(ARO Proj. VW5140; ARO Proj. VW5224)
(AD-762503; ARO-VKF-TR-73-44; AEDC-TR-73-93) Avail: NTIS CSCL 07/4

An aerodynamic molecular beam has been used in an attempt to develop criteria for the determination of the onset of condensation in free-jet expansions of various gases. Measurements have been made of the total and monomer velocity distribution as a function of source pressure for the following conditions: (1) sonic orifice diameters of 0.0147, 0.0386, and 0.1245 cm, (2) source temperatures from 85 to 450K, (3) source pressures from 10 to 10,000 torr, (4) argon, nitrogen, oxygen, carbon monoxide, and carbon dioxide test gases, and (5) 20K skimmer and collimator surfaces. The variation of beam velocity with source pressure was characterized by an approximately constant value up to a particular pressure at which point the velocity started to increase. From a knowledge of the velocity increase and the properties of the gas, estimates of the fraction of condensate have been made. There are indications from some of the velocity measurements that contributions from evaporated or sublimated molecules may be affecting some of the velocity distributions. (Modified author abstract) GRA

N73-30267# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SHOCK WAVE INCIDENCE ON A WEDGE MOVING AT SUPERSONIC SPEED

G. M. Arutyunyan 6 Jun. 1973 13 p refs Transl. into ENGLISH from the monograph "Volny v Neuprugikh Sredakh" USSR, 1970 p 7-12
(AD-763283; FTD-HT-23-456-73) Avail: NTIS CSCL 20/4

A flow which is developing at the upper surface of a wedge moving at supersonic speed, when a plane shock wave is incident

on the wedge, can be calculated in the framework of a linearized theory, if the point which is determined by two parameters of the wedge belongs to a certain area in the reference plane.
GRA

N73-30268# Michigan Univ., Ann Arbor. Cavitation and Multiphase Flow Lab.
INVESTIGATIONS CONCERNING THE MODELING OF FLOW CAVITATION
Andreas P. Keller (Technical Univ. of Munich) Mar. 1973 40 p refs
(Grant NSF GK-1889)
(PB-220531/8; UMich-01357-28-T) Avail: NTIS HC $3.00 CSCL 20D

Cavitation tests of submerged rotationally symmetric bodies of different shapes and diameters, carried out in connection with an optical measurement of cavitation nucleus spectra show that cavitation inception is much influenced by the nuclei entrapped in the water. Investigations with four different qualities of test water indicate that diffusion plays no role in the nucleus motion, but that dynamic forces are responsible for the occurence of scale effects. The experimental results as well as the theoretical investigations, support Harvey's pore model for cavitation nuclei in calm water. Optical scattered-light procedures for determining nucleus size did not distinguish between gas bubbles and solids, but the results on measured nucleus spectra are informative.
Modified Author Abstract (GRA)

N73-30269# Michigan Univ., Ann Arbor. Cavitation and Multiphase Flow Lab.
LIQUID IMPACT BEHAVIOR OF VARIOUS ELASTOMERIC MATERIALS Technical Report, 1971-1972
Frederick G. Hammitt, E. E. Timm, J. B. Hwang, and Y. C. Huang Apr. 1973 33 p refs Presented at G-2 Comm. ASTM Symp., Jun. 1973 Sponsored by B. F. Goodrich Co., Brecksville, Ohio
(PB-220972/4; UMICH-01357-27-T) Avail: NTIS HC $3.00 CSCL 20D

Detailed photographs of liquid jet impact against elastomeric surfaces are presented and compared with impact and also cavitation erosion resistance. Some correlations between erosion resistance and material properties are presented. Author (GRA)

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N73-30270 National Lending Library for Science and Technology, Boston Spa (England).
CONDITIONS LENDING TO SHIP ICING AND COUNTER-ACTING THEM (FROM NON-SOVIET DATA)
N. I. Smirnov [1973] 6 p refs Transl. into ENGLISH from Tr. Arkticheskogo i Antarkt. Nauchn. Issled. (Leningrad), v. 298, 1972 p 174-178
(NLL-M-23007-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The speed of ice accumulation on vessels as a result of exposure to sea water spray depends on the wind speed, the state of the sea, the air temperature, and the duration of these elements. Sea spray occurs with wind speeds of over 16 kt while freezing of this onto the vessels occurs with air temperatures below minus 1.7 C. It is considered that the most dangerous form of ice accumulation on vessels and ice-breakers is that due to sea water spray in appropriate temperature conditions. Icing of this so-called glazed type possesses a large specific gravity and great powers of adhesion. According to data, with air temperature below minus 18 C, water striking the vessel is converted into small, dry ice crystals and does not stick to the cold vessel. Investigations show that the greatest power of adhesion of ice is observed with concrete and metal, and the least with wood and plastic. Author

N73-30271 National Lending Library for Science and Technology, Boston Spa (England).
A MODEL OF WIND SHEAR IN THE LOWER 50-METER SECTION OF THE GLIDE PATH, FROM DATA OF LOW-INERTIA MEASUREMENTS
V. G. Glazunov and V. G. Cverava [1973] 7 p refs Transl. into ENGLISH from the Russian
(NLL-M-23036-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The most dangerous section of a glide path is the lowest 50 meters. A heavy jet aircraft will cover this section in about 20 seconds, so that accounting for the effect of wind shear on the aircraft's dynamics requires making measurements of wind speed at a high rate of data intake and with averaging over a few seconds. Such data on the scalar magnitude of wind speed have been obtained using a low inertia apparatus on a tall meteorological mast. Data used in this analysis were obtained at an intake frequency of 2 sec. Wind speed values were put onto punched tapes, and the magnitudes of delta V were calculated for three layers from recorded wind speed data at heights of 2, 8, 25, and 49 m, taking into account the aircraft's transit time for the glide path sections lying between these heights. Groups of values of delta V were calculated for three sections of the glide path in the course of an 18 second interval. A total of 110 wind models of the glide path, with an interval between them of 30 seconds, were obtained. It was determined that strong wind shears (> 4 m/sec.30 m) are hazardous for the piloting of aircraft in the lower part of their glide paths. Author

N73-30272 National Lending Library for Science and Technology, Boston Spa (England).
THE STRUCTURES OF DUST STORMS ACCORDING TO INFORMATION FROM TELEVISION PICTURES FROM THE ITOS-1 ARTIFICIAL EARTH SATELLITE
B. V. Vinogradov, A. A. Grigorev, and V. B. Lipatov [1973] 5 p refs Transl. into ENGLISH from Dokl. Akad. Nauk (USSR), v. 205, no. 4, 1972 p 913-915
(NLL-M-23033-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Results are presented of an analysis of the structure of a dust storm using ITOS-1 television pictures. The TV picture over the plain of Mesopotamia and the northern part of the Persian Gulf gave a good view of dust storms and the fine sand laden currents in the atmosphere. Four gradations of turbidity due to dust in the atmosphere were distinguished. Judging from the space pictures the zone of dust turbidity consists of two elements: localized storms of fine sand or whirlwinds of isometric form; then, drawn out from these along the prevailing winds, dust and sand laden streams of air 500-600 km or more in length and 20-40 km wide. Analysis of the pictures shows, in addition, the connection between the dust storms and the underlying surface; dust storms die down over stony deserts and moist land; they follow low lying contours and skirt the higher ground. Finally, the results of space photography confirm ideas about the larger scale geological role of dust storms in the formation of relief and of friable sediments. Author

N73-30273*# Earth Satellite Corp., Washington, D.C.
FACILITATING THE EXPLOITATION OF ERTS IMAGERY USING SNOW ENHANCEMENT TECHNIQUES Bimonthly Progress Report, 1 Jul. - 31 Aug. 1973
Frank J. Wobber, Kenneth Martin, Principal Investigators, Roger Amato, and Thomas Leshendok 30 Aug. 1973 15 p ERTS (Contract NAS5-21744)
(E73-10930; NASA-CR-133587) Avail: NTIS HC $3.00 CSCL 08L

The author has identified the following significant results. Comparative analysis of snow-free and snow-covered imagery of the New England Test Area has resulted in a larger number of lineaments mapped from snow-covered imagery in three out of four sets of comparative imagery. Analysts unfamiliar with the New England Test Area were utilized; the quality of imagery was independently judged to be uniform. In all image sets, a greater total length of lineaments was mapped with the snow-covered imagery. The value of this technique for fracture mapping in areas with thick soil cover is suggested. A number of potentially useful environmental applications of snow enhance-

ment related to such areas as mining, land use, and hydrology have been identified.

N73-30274*# National Environmental Satellite Service, Washington, D.C.
EVALUATION OF ERTS DATA FOR CERTAIN OCEANOGRAPHIC USES Bimonthly Report, Jul. - Aug. 1973
Alan E. Strong, Principal Investigator Aug. 1973 2 p ERTS
(NASA Order S-70246-AG)
(E73-10932; NASA-CR-133603; BMR-8) Avail: NTIS HC $3.00 CSCL 08C

There are no author-identified significant results in this report.

N73-30275*# Stanford Univ., Calif. School of Earth Sciences.
MULTISPECTRAL SIGNATURES IN RELATION TO GROUND CONTROL SIGNATURES USING NESTED-SAMPLING APPROACH Progress Report, 3 Jul. - 2 Sep. 1973
R. J. P. Lyon and A. A. Green, Principal Investigators 3 Sep. 1973 12 p ERTS
(Contract NAS5-21884)
(E73-10933; NASA-CR-133604; PR-5) Avail: NTIS HC $3.00 CSCL 05B

There are no author-identified significant results in this report.

N73-30276*# Delaware Univ., Newark. College of Marine Studies.
APPLICATION OF ECOLOGICAL GEOLOGICAL AND OCEANOGRAPHIC ERTS-1 IMAGERY TO DELAWARE'S COASTAL RESOURCES PLANNING Progress Report, Jul. - Aug. 1973
V. Klemas, Principal Investigator 5 Sep. 1973 7 p refs ERTS
(Contract NAS5-21837)
(E73-10934; NASA-CR-133605) Avail: NTIS HC $3.00 CSCL 08C

The Author has identified the following significant results. Significant results obtained by analysis of digital ERTS-1 data are: (1) Statistical outputs indicating the reliability of discriminating eight coastal vegetation and land use classes on a given group of training sets included: (a) mean and standard deviation of response in each class chosen; (b) contribution tables indicating importance of each channel in discriminating each thematic class from the background; (c) scatter diagrams showing relationships of thematic spectral signatures in spectral space; and (d) classification table showing reliability (in percent) of identification of each thematic class. (2) Thematic color maps at a scale of 1:1,000,000 showing vegetation and land use categories for Delaware's entire coastal zone. (3) Thematic computer plots at specified smaller (i.e. 1:24,000) scales for comparison with existing map data such as U.S.G.S. topographic maps.

N73-30277*# California Univ., Berkeley. Space Sciences Lab.
AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA BASED ON ERTS-1 AND SUPPORTING AIRCRAFT DATA Progress Report
Robert N. Colwell, Principal Investigator 31 May 1973 78 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21827)
(E73-10935; NASA-CR-133606; PR-4) Avail: NTIS HC $6.00 CSCL 08F

There are no author-identified significant results in this report.

N73-30278*# Idaho Univ., Moscow. Coll. of Forestry, Wildlife, and Range Sciences.
APPLICATION OF REMOTE SENSING IN THE STUDY OF VEGETATION AND SOILS IN IDAHO
E. W. Tisdale, Principal Investigator 31 Aug. 1973 1 p ERTS
(Contract NAS5-21850)
(E73-10936; NASA-CR-133607) Avail: NTIS HC $3.00 CSCL 08F

There are no author-identified significant results in this report.

N73-30279*# Dartmouth Coll., Hanover, N.H. Dept. of Earth Sciences.
JULY 1973 GROUND SURVEY OF ACTIVE CENTRAL AMERICAN VOLCANOES Progress Report, May - Jul. 1973
Richard E. Stoiber, Principal Investigator and William I. Rose, Jr. (Michigan Technol. Univ., Houghton) Aug. 1973 33 p refs EREP
(Contract NAS9-13311)
(E73-10937; NASA-CR-133608) Avail: NTIS HC $3.75 CSCL 08G

The author has identified the following significant results. Ground survey has shown that thermal anomalies of various sizes associated with volcanic activity at several Central American volcanoes should be detectable from Skylab. Anomalously hot areas of especially large size (greater than 500 m in diameter) are now found at Santiaguito and Pacaya volcanoes in Guatemala and San Cristobal in Nicaragua. Smaller anomalous areas are to be found at least seven other volcanoes. This report is completed after ground survey of eleven volcanoes and ground-based radiation thermometry mapping at these same points.

N73-30280*# Kansas Univ., Lawrence. Space Technology Center.
SKYLAB STUDY OF WATER QUALITY Progress Report, Mar. - May 1973
H. L. Yarger, Principal Investigator and James R. McCauley May 1973 8 p EREP
(Contract NAS9-13271)
(E73-10938; NASA-CR-133609) Avail: NTIS HC $3.00 CSCL 08H

There are no author-identified significant results in this report.

N73-30281*# Kansas Univ., Lawrence. Space Technology Center.
SKYLAB STUDY OF WATER QUALITY Progress Report, Jun. - Aug. 1973
H. L. Yarger, Principal Investigator and James R. McCauley Aug. 1973 3 p EREP
(Contract NAS9-13271)
(E73-10939; NASA-CR-133610) Avail: NTIS HC $3.00 CSCL 08H

There are no author-identified significant results in this report.

N73-30282*# Alaska Univ., Fairbanks. Geophysical Inst.
GLACIOLOGICAL AND VOLCANOLOGICAL STUDIES IN THE WRANGELL MOUNTAINS, ALASKA Semiannual Technical Report, Feb. - Jul. 1973
Carl S. Benson, Principal Investigator and Lewis H. Shapiro 31 Jul. 1973 10 p ref ERTS
(Contract NAS5-21833)
(E73-10940; NASA-CR-133611; SATR-2) Avail: NTIS HC $3.00 CSCL 08G

There are no author-identified significant results in this report.

N73-30283*# Arizona Univ., Tucson. Dept. of Biological Sciences.
STUDY OF THE MARINE ENVIRONMENT OF THE NORTHERN GULF OF CALIFORNIA Special Report, period ending 30 Jun. 1973
J. R. Hendrickson, Principal Investigator 30 Jun. 1973 2 p ERTS
(Contract NAS5-21777)
(E73-10941; NASA-CR-133612) Avail: NTIS HC $3.00 CSCL 08A

The author has identified the following significant results. While occupying standard oceanographic stations in the delta region of the Colorado River, two species of insects were collected which were of special interest. One of these is a single specimen of corixid bug, hitherto familiar to the investigators only as a freshwater insect, but taken swimming actively in high salinity water along with characteristic marine plankton. Further investigation showed that the species taken is well known from saline ponds but this is apparently the first record of its occurrence in a complete marine community. A small note on this collec-

tion record was prepared for publication and sent in manuscript form to NASA. The other record is of three specimens of a cicindelid beetle (normally a beach inhabitant) found at a night light for larval fish collection on station in the Colorado delta. The beetles were observed to light on and take off from water surface while actively moving around the night light. There is an interesting question of whether this species (Cicindela sinaloae schrammeli Cazier) may be especially adapted for a predatory life on the surface film, while the other two (larger) species sympatric with it are restricted to hunting on land.

N73-30284*# Stanford Univ., Calif. School of Earth Sciences.
STRUCTURAL AND LITHOLOGIC STUDY OF NORTHERN COAST RANGES AND SACRAMENTO VALLEY, CALIFORNIA Progress Report, 1 Jul. - 1 Sep. 1973
Ernest I. Rich, Principal Investigator 1 Sep. 1973 3 p ERTS
(Contract NAS5-21775)
(E73-10942; NASA-CR-133613) Avail: NTIS HC $3.00 CSCL 08E

The author has identified the following significant results. The pattern of linear systems within the project area has been extended into the western foothill belt of the Sierra Nevada. The chief pattern of linear features in the western Sierran foothill belt trends about N. 10 - 15 deg W., but in the vicinity of the Feather River the trend of the features abruptly changes to about N. 50-60 deg W and appears to be contiguous across the Sacramento Valley with a similar system of linear features in the Coast Ranges. The linear features in the Modoc Plateau and Klamath Mt. areas appear unrelated to the systems detected in the Coast Ranges of Sierran foothill belt. Although the change in trend of the Sierran structural features has been previously suggested and the interrelationship of the Klamath Mt. region with the northern Sierra Nevadas has been postulated, the data obtained from the ERTS-1 imagery strengthens these notions and provides for the first time evidence of a direct connection of the structural trends within the alluviated part of the Sacramento Valley. In addition rocks of Pleistocene and Holocene age are offset by some of the linear features seen on ERTS-1 imagery and hence may record the latest episode of geologic deformation in north-central California.

N73-30285*# Agricultural Research Service, Weslaco, Tex.
[SL-2 MULTISPECTRAL BAND CAMERA PHOTOGRAPHY] Progress Report, Aug. 1973
Craig L. Wiegand, Principal Investigator 7 Sep. 1973 2 p EREP
(NASA Order T-4105-B)
(E73-10943; NASA-CR-133619; PR-3) Avail: NTIS HC $3.00 CSCL 14E

There are no author-identified significant results in this report.

N73-30286*# Kansas Univ. Center for Research, Inc., Lawrence. Space Technology Labs.
[SOIL MOISTURE AND VEGETATION SURVEYS OF TEXAS AND KANSAS] Monthly Progress Report
Joe R. Eagleman, Principal Investigator 31 Aug. 1973 1 p EREP
(Contract NAS9-13273)
(E73-10944; NASA-CR-133620) Avail: NTIS HC $3.00 CSCL 02C

There are no author-identified significant results in this report.

N73-30287*# South Dakota State Univ., Brookings. Remote Sensing Inst.
[SITE SELECTION AND DATA ACQUISITION FOR SL-3 MISSION] Monthly Progress Report, period ending 1 Sep. 1973
Victor I. Myers, Principal Investigator 1 Sep. 1973 3 p EREP
(Contract NAS9-13337)
(E73-10945; NASA-CR-133621) Avail: NTIS HC $3.00 CSCL 14B

There are no author-identified significant results in this report.

N73-30288*# Agricultural Research Service, Weslaco, Tex.
REFLECTANCE OF VEGETATION, SOIL, AND WATER Progress Report, 19 Jun. - 19 Aug. 1973
Craig L. Wiegand, Principal Investigator 19 Aug. 1973 6 p ERTS
(NASA Order S-70251-AG)
(E73-10946; NASA-CR-133622; PR-4) Avail: NTIS HC $3.00 CSCL 08M

The author has identified the following significant results. A ratio of MSS channels 5 and 7 (5/7) and 5 to 6 (5/6) signals resulted in a correct recognition of 86.9% of the members of representative crop and soil conditions, compared with recognitions of 60.0, 64.1, 74.1, and 81.4% for channels 4, 5, 6, and 7 taken individually. Based on this result a satellite channel ratio procedure has been developed that enhances line printer gray maps for more efficient experimental test site location in the CCT data. Because independent estimates are not available to judge acreage estmates derived from ERTS-1 data against, except for a few crops, an interpenetrating sample constituting 3.5% of the county is ground truthed periodically. The crop of land uses and their acreages, respectively, as estimated from the interpenetrating samples, are: cotton, 129,714; sorghum, 182,783; mixed citrus, 53,954; oranges, 16,929; grapefruit, 13,863; rangeland, 137,845; and improved pastures, 57,169.

N73-30289*# Science Applications, Inc., La Jolla, Calif.
DETERMINATION OF AEROSOL CONTENT IN THE ATMOSPHERE FROM ERTS-1 DATA Progress Report, 7 Jul. - 6 Sep. 1973
Claus B. Ludwig and Michael Griggs, Principal Investigators 7 Sep. 1973 11 p ERTS
(Contract NAS5-21860)
(E73-10947; NASA-CR-133623; PR-6) Avail: NTIS HC $3.00 CSCL 04A

The author has identified the following significant results. Useful empirical relationships between apparent contrast at the Salton Sea/desert test site and the aerosol content of the atmosphere have been found for MSS 4, 5, and 6. This provides another technique to measure the atmospheric aerosol content, in addition to the method of measuring radiance over water surfaces previously reported. Analysis of desert data has shown, as predicted by theory, that the radiance over high albedo surfaces is insensitive to changes in the aersol content of the atmosphere.

N73-30290*# International Business Machines Corp., Gaithersburg, Md. Federal Systems Center.
ALL DIGITAL PRECISION PROCESSING OF ERTS IMAGES Progress Report, 1 Jul. - 31 Aug. 1973
Ralph Bernstein, Principal Investigator 7 Sep. 1973 4 p ERTS
(Contract NAS5-21716)
(E73-10948; NASA-CR-133624) Avail: NTIS HC $3.00 CSCL 05B

There are no author-idenfified significant results in this report.

N73-30291*# Geological Survey, Denver, Colo.
EVALUATION OF ERTS-1 IMAGERY FOR MAPPING QUATERNARY DEPOSITS AND LANDFORMS IN THE GREAT PLAINS AND MIDWEST Progress Report, 1 Jan. - 28 Feb. 1973
Roger B. Morrison, Principal Investigator and George R. Hallberg (Iowa Geological Survey, Iowa City) 1 Mar. 1973 14 p ERTS
(NASA Order S-70243-AG-1)
(E73-10949; NASA-CR-133625) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. The main landform associations and larger landforms are readily identifiable on the better images and commonly the gross associations of surficial Quaternary deposits also can be determined primarily by information on landforms and soils (obtained by analysis of stream dissection and drainage and stream-divide patterns, land use patterns, etc.). Maps showing the Quaternary geologic-terrain units that can be distinguished on the ERTS-1 images are being prepared for study areas in Illinois, Iowa, Missouri, Kansas, Nebraska, and South Dakota.

Preliminary maps of 1:1,000,000 scale are included for three of the study areas: the Grand Island and Fremont, Nebraska, and the Davenport, Iowa-Illinois, 1 deg x 2 deg quadrangles. These maps exemplify the first phase of investigations, which consists of identifying and mapping landform and land use characteristics and geologic-surficial materials directly from the ERTS-1 images alone, with no additional information. These maps show that commonly the boundaries of geologic-terrain units can be delineated more accurately on ERTS-1 images than on topographic maps at 1:250,000 scale.

N73-30292*# Geological Survey, Denver, Colo.
APPLICATION OF ERTS-1 IMAGERY TO DETECTING AND MAPPING MODERN EROSION FEATURES AND TO MONITORING EROSIONAL CHANGES, IN SOUTHERN ARIZONA Progress Report, 1 Feb. - 31 Mar. 1973
Roger B. Morrison, Principal Investigator and Maurice E. Cooley (Geological Survey, Tucson, Ariz.) 1 Apr. 1973 36 p ERTS
(NASA Order S-70243-AG-4)
(E73-10950; NASA-CR-133626) Avail: NTIS HC $4.00 CSCL 08B

The author has identified the following significant results. The chief results during the reporting period were three 1:1,000,000 scale maps made from one ERTS-1 frame (1085-17330, 16 October 1972) showing: (1) the three most important types of materials in terms of the modern erosion problem: the readily erodible soils, gravel piedmonts and basin-fill areas, and consolidated rocks; (2) alluvial fans (dissected and relatively undissected); and (3) (as an additional bonus) linear structural features. Eight key areas (small parts of the whole study area) were selected for detailed study, and mapping was started in two of them, by interpretation of ultrahigh (U-2 and RB-57) airphotos, supplemented by field studies. In these areas detailed mapping was done not only on the modern erosion phenomena (arroyos, gullies, modern flood plains and terraces, and areas of sheet erosion and deposition), but also other features pertinent to the erosion problem, such as slope-local relief, landforms rock units, soil particle size and erodibility, and classes of vegetative cover.

N73-30293*# Geological Survey, Denver, Colo.
EVALUATION OF ERTS-1 IMAGERY FOR MAPPING QUATERNARY DEPOSITS AND LANDFORMS IN THE GREAT PLAINS AND MIDWEST Progress Report, 1 Mar. - 30 Apr. 1973
Roger B. Morrison, Principal Investigator and George R. Hallberg (Iowa Geological Survey, Iowa, City) 1 May 1973 10 p refs ERTS
(NASA Order S-70243-AG-1)
(E73-10951; NASA-CR-133627) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. The main landform associations and larger landforms are readily identifiable on the better images and commonly the gross associations of surficial Quaternary deposits also can be differentiated, primarily by information on landforms and soils. Maps showing the Quaternary geologic-terrain units that can be differentiated from the ERTS-1 images are being prepared for study areas in Illinois, Iowa, Missouri, Kansas, Nebraska, and South Dakota. Preliminary maps at 1:1 million scale are given of two of the study areas, the Peoria and Decatur, Illinois, 1 deg x 2 quadrangles. These maps exemplify the first phase of investigations, which consists of identifying and mapping landform and land use characteristics and geologic-surficial materials directly from ERTS-1 images alone, without input of additional data. These maps shown that commonly the boundaries of geologic-terrain units can be identified more accurately on ERTS-1 images than on topographic maps of 1:250,000 scale. From analysis of drainage patterns, stream-divide relations, and tone and textural variations on the ERTS-1 images, the trends of numerous moraines of Wisconsinan and possibly some of Illinoian age were mapped. In the Peoria study area the trend of a buried valley of the Mississippi River is revealed.

N73-30294*# Geological Survey, Washington, D.C.
INVESTIGATION OF ERTS-A IMAGES FOR APPLICATION TO THEMATIC MAPPING Progress Report, 1 Jan. - 30 Jun. 1973
Dean T. Edson, Principal Investigator and Doyle G. Smith 1 Jul. 1973 5 p ERTS
(NASA Order S-70243-AG)
(E73-10952; NASA-CR-133628) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. Theme extractions, enlarged to proper scale can prove a simple and convenient tool for evaluation of small scale map content, and as a guide to and for map revision. Open water extractions provide a graphic, easy to read, historical documentation of the recent Mississippi River flood at successive times during the flood period. Open water extractions, used in conjunction with swamp/wetland extractions, can be used to document and monitor temporal changes in wetland water levels.

N73-30295*# Geological Survey, Washington, D.C.
THE CARTOGRAPHIC APPLICATION OF ERTS/RBV IMAGERY IN POLAR REGIONS Progress Report, 1 Jan. - 30 Jun. 1973
William R. MacDonald, Principal Investigator 1 Jul. 1973 5 p ERTS
(NASA Order S-70243-AG-2)
(E73-10953; NASA-CR-133629) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. Results of the SR-149 experiments demonstrated the feasibility of revising coastlines on maps of Antarctica, detected gross changes in the northern limits of the three largest ice shelves in the world, and led to the discovery of unmapped geographical features in Antarctica. Analyses of MSS imagery during the investigations show positive identification and obvious changes in size, shape, and position of such features as glaciers, ice tongues, ice shelves, and fast ice when compared to the existing USGS 1:250,000 scale maps. Investigations also pointed out that accurate and meaningful photoimage mosaics can be compiled at scales of 1:500,000 and 1:1,000,000 over the Polar Regions. With respect to the Antarctic region, many thousands of square miles can be image mapped for the very first time if cloud-free imagery becomes available and at a great reduction in cost of compilation. The international scientific community will benefit from such timely products. Current maps are a necessity for proper planning for field operations, especially over the treacherous terrain of the Antarctic.

N73-30296*# Geological Survey, Washington, D.C.
ANALYSIS STUDY OF MULTISPECTRAL DATA, ERTS-A, FROM AN AREA IN WEST PAKISTAN Progress Report, 1 Jan. - 30 Jun. 1973
Robert G. Schmidt, Principal Investigator 19 Jul. 1973 5 p ERTS
(Contract NASA Order S-70243-AG)
(E73-10954; NASA-CR-133630) Avail: NTIS HC $3.00 CSCL 05B

The author has identified the following significant results. Geomorphic features related to a known porphyry copper deposit at Saindak, western Chagai District, Pakistan, are easily distinguished on ERTS-1 images. No new prospecting sites were recognized on the basis of the images alone, but new information from the images was used in conjunction with known geology to evaluate two previously known speculative areas and to suggest one additional one. The study showed that Saindak-type deposits are less likely in some extensive areas of the Chagai District than formerly believed. The Saindak deposit is in an area of relatively soft folded sedimentary and volcanic rocks. The deposit is characterized by a linear zone of easily eroded sulfide-rich rock surrounded by a resistant rim of hornfels and propylitically altered rock. Both this rim and the central sulfide-rich valley are conspicuous features on the images. Swarms of dikes are probably useful for distinguishing real rims from other resistant rock types, but there is no expression of them on the image, although they are easily seen on aerial photographs of the Saindak rim. During field mapping, patches of strong red and yellow hue related to the mineral natrojarosite were noted in the central valley. Attempts to detect a color anomaly using simple false color composites were not successful.

N73-30297*# Geological Survey, Washington, D.C. Geographic Applications Program.

LAND USE MAPPING AND MODELLING FOR THE PHOENIX QUADRANGLE Progress Report, 1 Jan. - 30 Jun. 1973
John L. Place, Principal Investigator 1 Jul. 1973 7 p ERTS
(NASA Order S-70243-AG)
(E73-10955; NASA-CR-133631) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. The land use of the Phoenix Quadrangle in Arizona had been mapped previously from aerial photographs and recorded in a computer data bank. During the ERTS-1 experiment, changes in land use were detected using only the ERTS-1 images. The I2S color additive viewer was used as the principal image enhancement tool, operated in a multispectral mode. Hard copy color composite images of the best multiband combinations from ERTS-1 were made by photographic and diazo processes. The I2S viewer was also used to enhance changes between successive images by quick flip techniques or by registering with different color filters. More recently, a Bausch and Lomb zoom transferscope has been used for the same purpose. Improved interpretation of land use change resulted, and a map of changes within the Phoenix Quadrangle was compiled. The first level of a proposed standard land use classification system was sucessfully used. ERTS-1 underflight photography was used to check the accuracy of the ERTS-1 image interpretation. It was found that the total areas of change detected in the photos were comparable with the total areas of change detected in the ERTS-1 images.

N73-30298*# Geological Survey, Arlington, Va.
DYNAMICS OF SUSPENDED SEDIMENT PLUMES IN LAKE ONTARIO Progress Report, 1 Jan. - 30 Jun. 1973
Edward J. Pluhowski, Principal Investigator 1 Jul. 1973 13 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70243-AG-2)
(E73-10956; NASA-CR-133632) Avail: NTIS HC $3.00 CSCL 08H

The author has identified the following significant results. Enhancement of ERTS-1 imagery yielded excellent quality 35-mm color slides and prints of several prominent turbidity plumes in Lake Ontario. Selected ERTS-1 frames of the Welland Canal and Genesee River plumes will be used to develop time-lapse sequences showing the impact of wind stress on each plume. Unusually high lake levels during the spring resulted in extensive beach erosion along the entire Lake Ontario shoreline. The resulting high concentrations of suspended matter generated highly turbid (up to 420 JTU) nearshore conditions that appeared milky white in the imagery obtained April 12 and 29th, 1973. During the shipping season, both the Welland Canal and a diversion channel at Port Dalhousie, Ontario, produced readily identifiable turbidity plumes in Lake Ontario. However, in the winter neither plume was visible in the ERTS-1 imagery suggesting sharply lower sediment discharge into Lake Ontario from these sources.

N73-30299*# Geological Survey, McLean, Va.
OVERALL EVALUATION OF ERTS-1 IMAGERY FOR CARTOGRAPHIC APPLICATION Progress Report, 1 Jan. - 1 Aug. 1973
Alden P. Colvocoresses, Principal Investigator Aug. 1973 51 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70243-AG-2)
(E73-10957; NASA-CR-133633) Avail: NTIS HC $4.75 CSCL 08B

The author has identified the following significant results. Scientific results may be summarized as follows: (1) A geodetic (UTM) grid can be fitted to MSS bulk images with a positional accuracy in the order of 50 meters (rms). (2) The MSS imagery as corrected and printed in bulk form is in effect or a defined map projection. This projection, if optimized for cartographic presentation, will have distortions in the order of only 1 part in 10,000. (3) The orbit of ERTS-1 and image delineation of MSS imagery can be held by NASA so that predesignated scenes may be identified and used as a basis for a map series. This concept could reduce the time and cost of ERTS-1 image map production many fold as compared to standard quadrangle format production.

N73-30300*# Wyoming Univ., Laramie. Dept. of Geology.
GEOLOGY OF PHOTO LINEAR ELEMENTS, GREAT DIVIDE BASIN, WYOMING Special Report
D. L. Blackstone, Jr. 1 Jun. 1973 14 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21799)
(E73-10958; NASA-CR-133634) Avail: NTIS HC $3.00 CSCL 08G

The author has identified the following significant results. Ground examination of photo linear elements in the Great Divide Basin, Wyoming indicates little if any tectonic control. Aeolian aspects are more widespread and pervasive than previously considered.

N73-30301*# TRW Systems Group, Redondo Beach, Calif.
ERTS IMAGE DATA COMPRESSION TECHNIQUE EVALUATION Monthly Progress Report, period ending 1 Sep. 1973
Donald J. Spencer, Principal Investigator 6 Sep. 1973 1 p ERTS
(Contract NAS5-21746)
(E73-10959; NASA-CR-133635) Avail: NTIS HC $3.00 CSCL 05B

There are no author-identified significant results in this report.

N73-30302*# Kennecott Exploration, Inc., Salt Lake City, Utah. Exploration Service Dept.
RECOGNITION OF THE GEOLOGIC FRAMEWORK OF PORPHYRY COPPER DEPOSITS ON ERTS-1 IMAGERY Progress Report
John C. Wilson, Principal Investigator 6 Sep. 1973 4 p ERTS
(Contract NAS5-21769)
(E73-10960; NASA-CR-133636) Avail: NTIS HC $3.00 CSCL 08G

There are no author-identified significant results in this report.

N73-30303*# Earth Satellite Corp., Washington, D.C.
AN INVESTIGATION TO IMPROVE THE MENHADEN FISHERY PREDICTION AND DETECTION MODEL THROUGH THE APPLICATION OF ERTS-A DATA Interim Report, Jan. - Aug. 1973
Paul M. Maughan, Principal Investigator Sep. 1973 17 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21743)
(E73-10961; NASA-CR-133637) Avail: NTIS HC $3.00 CSCL 08A

The author has identified the following significant results. Linear regression of secchi disc visibility against number of sets yielded significant results in a number of instances. The variability seen in the slope of the regression lines is due to the nonuniformity of sample size. The longer the period sampled, the larger the total number of attempts. Further, there is no reason to expect either the influence of transparency or of other variables to remain constant throughout the season. However, the fact that the data for the entire season, variable as it is, was significant at the 5% level, suggests its potential utility for predictive modeling. Thus, this regression equation will be considered representative and will be utilized for the first numerical model. Secchi disc visibility was also regressed against number of sets for the three day period September 27-September 29, 1972 to determine if surface truth data supported the intense relationship between ERTS-1 identified turbidity and fishing effort previously discussed. A very negative correlation was found. These relationships lend additional credence to the hypothesis that ERTS imagery, when utilized as a source of visibility (turbidity) data, may be useful as a predictive tool.

N73-30304*# North Carolina State Univ., Raleigh. Dept. of Geosciences.
UTILIZATION OF ERTS-A DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA

Progress Report, Jul. - Aug. 1973
Charles W. Welby, Principal Investigator 31 Aug. 1973 33 p refs ERTS
(Contract NAS5-21732)
(E73-10962; NASA-CR-133648) Avail: NTIS HC $3.75 CSCL 08F

There are no author-identified significant results in this report.

N73-30305*# TRW Systems Group, Redondo Beach, Calif.
EVALUATION OF DIGITAL CORRECTION TECHNIQUES FOR ERTS IMAGES Bimonthly Progress Report, Jul. - Aug. 1973
John E. Taber, Principal Investigator and S. S. Rifman Aug. 1973 4 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21814)
(E73-10963; NASA-CR-133647) Avail: NTIS HC $3.00 CSCL 05B

There are no author-identified significant results in this report.

N73-30306*# Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.
EVALUATION OF SATELLITE IMAGERY AS AN INFORMATION SERVICE FOR INVESTIGATING LAND USE AND NATURAL RESOURCES (SKYLAB) Progress Report, 1-13 Aug. 1973
Ernest E. Hardy, Principal Investigator 31 Aug. 1973 1 p EREP
(Contract NAS9-13364)
(E73-10964; NASA-CR-133650) Avail: NTIS HC $3.00 CSCL 14E

There are no author-identified significant results in this report.

N73-30307*# Minnesota State Planning Agency, St. Paul.
LAND USE MANAGEMENT IN MINNESOTA Progress Report, 1 Jul. - 31 Aug. 1973
Joseph E. Sizer, Principal Investigator 6 Sep. 1973 9 p ERTS
(Contract NAS5-21801)
(E73-10965; NASA-CR-133744) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report.

N73-30308*# North Carolina State Univ., Raleigh.
UTILIZATION OF EREP DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA Quarterly Progress Report
Charles W. Welby, Principal Investigator 10 Sep. 1973 1 p EREP
(Contract NAS9-13321)
(E73-10966; NASA-CR-133745) Avail: NTIS HC $3.00 CSCL 08F

There are no author-identified significant results in this report.

N73-30309*# Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
IN SITU SPECTRORADIOMETRIC QUANTIFICATION OF ERTS DATA Progress Report, 15 Jun. - 15 Aug. 1973
Edward Yost, Principal Investigator 15 Aug. 1973 1 p ERTS
(Contract NAS5-21793)
(E73-10967; NASA-CR-133746) Avail: NTIS HC $3.00 CSCL 05B

There are no author-identified significant results in this report.

N73-30310*# Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
AN INTERDISCIPLINARY STUDY OF THE ESTUARINE AND COASTAL OCEANOGRAPHY OF BLOCK ISLAND SOUND AND ADJACENT NEW YORK COASTAL WATERS Progress Report, 15 Jun. - 15 Aug. 1973
Edward Yost, Principal Investigator 15 Aug. 1973 2 p ERTS
(Contract NAS5-21792)
(E73-10968; NASA-CR-133747) Avail: NTIS HC $3.00 CSCL 08J

There are no author-identified significant results in this report.

N73-30311*# Earth Satellite Corp., Washington, D.C. Geosciences and Environmental Applications Div.
STUDY OF APPLICATION OF ERTS-A IMAGERY TO FRACTURE-RELATED MINE SAFETY HAZARDS IN THE COAL MINING INDUSTRY Progress Report, 1 Jul. - 1 Sep. 1973
Charles E. Wier (Indiana Geological Survey), Frank J. Wobber, Principal Investigators, Orville R. Russell, Roger V. Amato, and Thomas Leshendok 10 Sep. 1973 4 p ERTS
(Contract NAS5-21795)
(E73-10970; NASA-CR-133749) Avail: NTIS HC $3.00 CSCL 08I

The author has identified the following significant results. The Kings Station Mine in Gibson County, Indiana has experienced considerable roof fall problems. Detailed fracture mapping of the mine area was done with ERTS-1 and aircraft imagery, and a prediction map of roof problem areas was produced in advance of a visit. The visit to the mine and discussions with the operator indicated that of four zones mapped as potential problem areas, three coincided with areas of excessive roof fall. This positive correlation of 75% lends confidence to the validity of the technique being applied in the investigation. The mine officials expressed an interest in the project and are anxious to see the final product maps which are forthcoming.

N73-30312*# Kansas Univ. Center for Research, Inc., Lawrence.
THE INFLUENCE OF IMAGE POSITION ON URBAN PLACE DETECTION
Robert M. Haralick, Principal Investigator 14 Jan. 1973 9 p ref ERTS
(Contract NAS5-21822)
(E73-10971; NASA-CR-133750) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. The ability of ERTS-1 MSS imagery to detect small urban places appears to vary with the position of the place in the image, as well as from band to band. Urban places of smallest size (approximately 2000 population) seem more detectable in the westernmost 3.5 degree scan segment. A relationship may exist between shadowing of vertical features and detectability.

N73-30313*# Kansas Univ. Center for Research, Inc., Lawrence.
CHANGE IN SURFICIAL WATER AREA, QUIVERA NATIONAL WILDLIFE REFUGE, STAFFORD COUNTY, KANSAS
H. L. Yarger, Principal Investigator 27 Jan. 1973 5 p ERTS (Contract NAS5-21822)
(E73-10974; NASA-CR-133753) Avail: NTIS HC $3.00 CSCL 08H

The author has identified the following significant results. MSS-7 images acquired in August, October, and December 1972 revealed changes in both the number of water pools and surficial water area of larger pools in Quivera National Wildlife Refuge (Big and Little Salt Marsh), Stafford County, Kansas.

N73-30314*# Kansas Univ. Center for Research, Inc., Lawrence.
PRECIPITATION PATTERN ON ERTS-1 IMAGE
S. A. Morain, Principal Investigator and Donald L. Williams 10 Apr. 1973 3 p ref Original contains imagary. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21822)
(E73-10975; NASA-CR-133754) Avail: NTIS HC $3.00 CSCL 04B

The author has identified the following significant results. A precipitation pattern in west central Kansas was detected on an MSS image acquired 22 September 1972. Good correspondence

was found between the interpolated one-inch isohyet and the apparent precipitation boundary in the image.

N73-30315*# Kansas Univ. Center for Research, Inc., Lawrence.
URBAN STREET PATTERNS DETECTABLE FROM ERTS-1
Stan A. Morain, Principal Investigator and Donald L. Williams 13 Apr. 1973 3 p ERTS
(Contract NAS5-21822)
(E73-10976; NASA-CR-133755) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. The major street patterns in Lincoln, Nebraska, are detectable on the January 24, 1973 ERTS MSS-4 image. To further study and identify the street patterns, a 3x Polaroid enlargement was made of the city from the image. An overlay of the enlargement was used to map the street patterns, with reference to the original image for clarity. The technique seems to be adaptable for updating standard road maps.

N73-30316*# Kansas Univ. Center for Research, Inc., Lawrence.
IDENTIFICATION OF BASIC CLOUD TYPES FROM ERTS IMAGERY
Stanley A. Morain, Principal Investigator and Donald L. Williams 9 May 1973 6 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21822)
(E73-10977; NASA-CR-133756) Avail: NTIS HC $3.00 CSCL 04B

The author has identified the following significant results. It was found that seven basic cloud types could be detected from ERTS-1 imagery. Each type exhibited characteristics that made them distinct. Suitable examples of each type were chosen, described, and a cloud identification item-index key prepared.

N73-30317# Joint Publications Research Service, Arlington, Va.
MEETING OF THE SOVIET-AMERICAN WORKING GROUP ON REMOTE SENSING OF THE NATURAL ENVIRONMENT FROM SPACE
8 Aug. 1973 193 p refs Transl. into ENGLISH of the publ. "Vstrecha Sovetsko-Amerikanskoy Rabochey Groppy po Issledovaniyu Okruzhayushchey Sredy iz Kosmosa" Moscow, Acad. of Sci. USSR, 1973 173 p Conf. held at Moscow, 12-17 Feb. 1973
(JPRS-59739) Avail: NTIS HC $11.75

Research papers are presented on the geological interpretation of images of the earth taken from outer space and their application for mapping the natural environment. For individual titles, see N73-30318 through N73-30329.

N73-30318 Joint Publications Research Service, Arlington, Va.
TECHNICAL MEDIA FOR OBTAINING, DELIVERING AND PROCESSING IMAGES TAKEN FROM SPACE c14
In its Meeting of the Sov.-Am. Working Group on Remote Sensing of the Nat. Environment from Space (JPRS-59739) 8 Aug. 1973 p 3-15 refs Transl. into ENGLISH from the publ. "Vstrecha Sovetsko-Amerikanskoy Rabochey Gruppy po Issledovaniyu Okruzhayushchey Sredy iz Kosmosa" Moscow, Acad. of Sci. USSR, 1973 (For availability see N73-30317 21-13)

An overview is presented of the development of technologies and equipment in the US and USSR for high resolution space photography of the earth. The earth satellites of both countries are discussed in terms of onboard equipment, photographic techniques, image transmission, and ground processing procedures. Particular emphasis is placed on the advanced technologies employed with the ERTS satellites. D.L.G.

N73-30319 Joint Publications Research Service, Arlington, Va.
GENERAL PRINCIPLES OF GEOLOGICAL INTERPRETATION OF REMOTE IMAGES OF THE EARTH'S SURFACE
In its Meeting of the Sov.-Am. Working Group on Remote Sensing of the Nat. Environment from Space (JPRS-59739) 8 Aug. 1973 p 16-19 refs Transl. into ENGLISH from the publ. "Vstrecha Sovetsko-Amerikanskoy Rabochey Gruppy po Issledovaniyu Okruzhayuschey Sredy iz Kosmosa" Moscow, Acad. of Sci. USSR, 1973 (For availability see N73-30317 21-13)

The basic principles of geological interpretation of aerial photographs are reviewed and their application to the interpretation of images from space is discussed. The methodology of interpreting both space and aerial photographs is proposed as being based on the single primary principle of studying the interrelations between the different geological phenomena and processes and the peculiarities of the exhibition of such interrelations in the landscaped mantle. The interpretive attributes, both direct and indirect, of geological formations are defined and their significance is discussed. D.L.G.

N73-30320 Joint Publications Research Service, Arlington, Va.
EXAMPLES OF SOLVING CERTAIN REGIONAL GEOLOGICAL PROBLEMS USING PHOTOGRAPHS FROM SPACE
In its Meeting of the Sov.-Am. Working Group on Remote Sensing of the Nat. Environment from Space (JPRS-59739) 8 Aug. 1973 p 20-30 refs Transl. into ENGLISH from the publ. "Vstrecha Sovetsko-Amerikanskoy Rabochey Gruppy po Issledovaniyu Okruzhayushchey Sredy iz Kosmosa" Moscow, Acad. of Sci. USSR, 1973 (For availability see N73-30317 21-13)

A literature review is presented of geological interpretations of space photographs obtained by Soviet and US satellites. Two principle areas are discussed in which these photographs are of extreme importance. These prime areas of application include: (1) use of the space photographs for defining the geological and tectonic maps more precisely and for solving tectonic problems, and (2) use of the photographs for geomorphological purposes. D.L.G.

N73-30321 Joint Publications Research Service, Arlington, Va.
SELECTION OF STANDARD SECTIONS AND ORGANIZATION OF OPERATIONS IN THEM c34
In its Meeting of the Sov.-Am. Working Group on Remote Sensing of the Nat. Environment from Space (JPRS-59739) 8 Aug. 1973 p 31-33 Transl. into ENGLISH from the publ. "Vstrecha Sovetsko-Amerikanskoy Rabochey Gruppy po Issledovaniyu Okruzhayushchey Sredy iz Kosmosa" Moscow, Acad. of Sci. USSR, 1973 (For availability see N73-30317 21-13)

Standard sections are defined as those which encompass the territories in which a procedure for geological interpretation of photographs from space must be developed. The factors involved in determining these sections are reviewed and the selection of three standard sections in the territory of the USSR is discussed. D.L.G.

N73-30322 Joint Publications Research Service, Arlington, Va.
TYAN-SHAN SECTION
In its Meeting of the Sov.-Am. Working Group on Remote Sensing of the Nat. Environment from Space (JPRS-59739) 8 Aug. 1973 p 34-55 Transl. into ENGLISH from the publ. "Vstrecha Sovetsko-Amerikanskoy Rabochey Gruppy po Issledovaniyu Okruzhayushchey Sredy iz Kosmosa" Moscow, Acad. of Sci. USSR, 1973 (For availability see N73-30317 21-13)

The first of three selected standard sections of the USSR is dealt with. A geological outline is given of the Tyan-Shan section and the general structural features are analyzed. The Tyan-Shan section consists of the regions where the latest tectonic movements, beginning at the end of the Eocene and the beginning of the Oligocene, are clearly exhibited. The complex geological structure of the Tyan-Shan section is exemplified by the formation of three structural stages which include: (1) a lower stage that appears to be Paleozoic and pre-Paleozoic; (2) a middle stage which is made up of comparatively thin carbonaceous-argillaceous, terrigenic salt, and gypsum-bearing deposits; and (3) an upper stage corresponding to the latest orogenic step and characterized by Molasse deposits of great thickness. D.L.G.

N73-30323 Joint Publications Research Service, Arlington, Va.
CAUCASIAN SECTION
In its Meeting of the Sov.-Am. Working Group on Remote Sensing of the Nat. Environment from Space (JPRS-59739) 8 Aug. 1973 p 56-72 Transl. into ENGLISH from the publ. "Vstrecha Sovetsko-Amerikanskoy Rabochey Gruppy po Issledovaniyu Okruzhayushchey Sredy iz Kosmosa" Moscow, Acad. of Sci. USSR, 1973 (For availability see N73-30317 21-13)

The Caucasian section, one of three standard sections of the USSR selected for investigation by space photography, is

geographically defined and its geological structure is outlined. The investigated region encompasses the region of the extreme northeastern burial of the Greater Caucasus (from the Aladash Ridge in the north to the Alyatskaya Ridge in the south), the Kurinskaya and Araksinskaya lowlands, the northern spurs of the Karabakhskiy Ridge and the Talysh Mountains. This territory is depicted on the medium-scale space photographs. Its eastern-most part directly adjacent to the Caspian Sea is also covered by the large-scale space photographs. Author

N73-30324 Joint Publications Research Service, Arlington, Va.
USTYURT SECTION
In its Meeting of the Sov.-Am. Working Group on Remote Sensing of the Nat. Environment from Space (JPRS-59739) 8 Aug. 1973 p 73-92 refs Transl. into ENGLISH from the publ. "Vstrecha Sovetsko-Amerikanskoy Rabochey Gruppy po Issledovaniyu Okruzhayushchey Sredy iz Kosmosa" Moscow, Acad. of Sci. USSR, 1973 (For availability see N73-30317 21-13)

The third of three standard sections of the USSR selected for investigation by space photography is discussed. The Ustyurt section is located in the southwestern part of the epipaleozoic Turan platform. Its relatively young age is partially responsible for the sharp expression of the platform dislocations. The specific interest in the Ustyurt section is determined by its high prospectiveness for oil and gas exploration. A geological outline of the section is presented along with discussions on interpreting the lithologic-stratigraphic complexes and tectonic structure. D.L.G.

N73-30325 Joint Publications Research Service, Arlington, Va.
RADAR AERIAL SURVEY AND ITS SIGNIFICANCE IN THE COMPLEMENT OF AERIAL AND SPACE GEOLOGICAL RESEARCH TECHNIQUES
V. B. Komarov, V. A. Starostin, and B. P. Nyavro *In its* Meeting of the Sov.-Am. Working Group on Remote Sensing of the Nat. Environment from Space (JPRS-59739) 8 Aug. 1973 p 93-106 refs Transl. into ENGLISH from the publ. "Vstrecha Sovetsko-Amerikanskoy Rabochey Gruppy po Issledovaniyu Okruzhayushchey Sredy iz Kosmosa" Moscow, Acad. of Sci. USSR, 1973 23 p (For availability see N73-30317 21-13)

The possibilities are discussed of using the aerial radar technique for geological research. The radar aerial survey data make it possible to obtain valuable information about the structural-tectonic composition, the material composition of rocks, and the nature of the relief. Author

N73-30326 Joint Publications Research Service, Arlington, Va.
APPLICATION OF PHOTOGRAPHS FROM SPACE FOR SMALL-SCALE MAPPING AND STUDY OF FARM LANDS
L. F. Yanvareva and Ye. I. Nikolayevskaya *In its* Meeting of the Sov.-Am. Working Group on Remote Sensing of the Nat. Environment from Space (JPRS-59739) 8 Aug. 1973 p 107-119 Transl. into ENGLISH from the publ. "Vstrecha Sovetsko-Amerikanskoy Rabochey Gruppy po Issledovaniyu Okruzhayushchey Sredy iz Kosmosa" Moscow, Acad. of Sci. USSR, 1973 13 p (For availability see N73-30317 21-13)

Direct and indirect interpretive signs are discussed in terms of their significance in distinguishing features on space photographs of farm lands. These features provide information on the agricultural characteristics of the landscape, the relief of the terrain, and the nature of the natural vegetation. Two tables are presented which list the interpretive attributes of farm lands and of fields of farm crops. D.L.G.

N73-30327 Joint Publications Research Service, Arlington, Va.
OPTIMAL SELECTION OF THE SPECTRAL INTERVALS OF REMOTE INDICATION OF THE NATURAL ENVIRONMENT FROM SPACE
K. Ya. Kondratyev, O. B. Vasilyev, and G. A. Ivanyan *In its* Meeting of the Sov.-Am. Working Group on Remote Sensing of the Nat. Environment from Space (JPRS-59739) 8 Aug. 1973 p 120-141 refs Transl. into ENGLISH from the publ. "Vstrecha Sovetsko-Amerikanskoy Rabochey Gruppy po Issledovaniyu Okruzhayushchey Sredy iz Kosmosa" Moscow, Acad. of Sci. USSR, 1973 30 p (For availability see N73-30317 21-13)

The problem of determining the optimal set of spectral intervals having maximum informativeness with minimum number of intervals is dealt with. The problem is solved on the basis of an objective (quantitative) analysis of the informativeness of the optical characteristics of the natural formation on various wavelengths. Using this method, spectral intervals were obtained which are proposed as being the most informative for surveying the earth's surface from a spacecraft. The obtained optimal intervals are compared with those used with the ERTS-1 and it is concluded that the ERTS-1 intervals cannot be considered optimal. D.L.G.

N73-30328 Joint Publications Research Service, Arlington, Va.
SOIL COVER AND ITS INTERPRETATION BASED ON AIRCRAFT AND SPACE SURVEY DATA
V. L. Andronnikov *In its* Meeting of the Sov.-Am. Working Group on Remote Sensing of the Nat. Environment from Space (JPRS-59739) 8 Aug. 1973 p 142-151 Transl. into ENGLISH from the publ. "Vstrecha Sovetsko-Amerikanskoy Rabochey Gruppy po Issledovaniyu Okruzhayushchev Sredy iz Kosmosa" Moscow, Acad. of Sci. USSR, 1973 13 p (For availability see N73-30317 21-13)

The possibilities were investigated of interpreting and compiling soil maps in the vicinity of the Tsimlyanskiy international test site using the photograph taken from space by the Soyuz-9 spacecraft and aerial survey data. The scale of the space photograph was 1:2,000,000, and the aerial photograph's scale was different. The pictures were black and white. During the experiment, the photographic images of different soil from the aerial and space photographs were compared and analyzed for the territory of different natural regions. Sections of different watershed, terraces and flood plains of a steppe river were analyzed. The field test data are presented with indications of the morphological, physical and physical-chemical data for the investigated soil. Author

N73-30329 Joint Publications Research Service, Arlington, Va.
GEOLOGICAL-STRUCTURAL INTERPRETATION OF PHOTOGRAPHS OF THE BALKHASH REGION FROM SPACE AND THEIR ROLE IN THE GEOLOGICAL STUDY OF CENTRAL KAZAKHSTAN
V. B. Komarov, N. V. Skublova, and N. A. Yakovlev *In its* Meeting of the Sov.-Am. Working group on Remote Sensing of the Nat. Environment from Space (JPRS-59739) 8 Aug. 1973 p 152-159 refs Transl. into ENGLISH from the publ. "Vstrecha Sovetsko-Amerikanskoy Rabochey Gruppy po Issledovaniyu Okruzhayushchev Sredy iz Kosmosa" Moscow, Acad. of Sci. USSR, 1973 17 p (For availability see N73-30317 21-13)

The geological-structural interpretation of a space photograph of the Balkhash test site (a space photograph from the Salyut satellite in June 1971) was used to outline the areas of development of terrigenic, volcanogenic and intrusive formations of the Paleozoic and Quaternary deposits of different genesis. The dislocations with a break in continuity of the northwestern, meridional, and sublatitudinal stride were revealed, including at the bottom of Balkhash Lake and in the area of development of the Mesozoic-Cenozoic, deposits more than 50 meters thick. Part of them are confirmed by geological data. In the geomorphological landscape of the test site, the peneplain and accumulation plains of different age are discriminated. The latest structure of the test site is interpreted as a dome-like uplift in the south separated by a trough from the stable region of the north shore of the Balkhash Lake. Author

N73-30330*# Scientific Translation Service, Santa Barbara, Calif.
APPLICATIONS SATELLITES: LEGAL ASPECTS. PART 2: THE REMOTE SENSING OF EARTH RESOURCES BY SATELLITES
A. Tchernonog Washington NASA Aug. 1973 18 p refs Transl. into ENGLISH from Rech. Spatial (France), v. 12, no. 3, 1973 p 1-5
(Contract NASw-2483)
(NASA-TT-F-15055) Avail: NTIS HC $3.00 CSCL 08F

The development of laws, as well as their enforcement concerning remote sensing is discussed within the framework of a large international cooperative effort. The legal areas applicable to remote sensing, international law, specific regulations, data collection, data distribution, judicial regions, and ground and space sectors are also discussed. T.M.R.

N73-30331*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HIGH LATITUDE ELECTRIC FIELDS AN THE MODULATIONS RELATED TO INTERPLANETARY MAGNETIC FIELD PARAMETERS
J. P. Heppner Jun. 1973 44 p refs Presented at the Chapman Symp. on Magnetospheric Motions, Boulder, Colo., 18-22 Jun. 1973 Submitted for publication
(NASA-TM-X-70444; X-645-73-227) Avail: NTIS HC $4.25 CSCL 08N

The meaning and characteristics of basic and average convection (i.e., electric field) patterns are described. The continuous existence of the basic convection pattern argues against treating magnetic field merging mechanisms as the fundamental cause of magnetospheric convection. However, whether related to merging or some other mechanism, interplanetary (IP) magnetic field conditions significantly modulate the distribution, magnitudes, and boundaries of the convection pattern. A previous correlation between azimuthal angles of the IP magnetic field and asymmetries in polar cap electric field distributions as seen by OGO-6 was reviewed. A new approach was taken to reveal correlations with the north-south angle and magnitude of the IP field as well as additional features which correlate with the azimuthal angle. Both significant correlations and conditions which show a lack of correlation were found. Several aspects of the correlations appear to be particularly important. Author

N73-30332*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NEAR EARTH MAGNETIC DISTURBANCE IN TOTAL FIELD AT HIGH LATITUDES. 2: INTERPRETATION OF DATA FROM OGO'S 2, 4, AND 6
R. A. Langel Aug. 1973 74 p refs Submitted for publication
(NASA-TM-X-70443; X-645-73-226) Avail: NTIS HC $5.75 CSCL 08N

Variations in the scalar magnetic field (delta B) from the polar orbiting OGO 2, 4, and 6 spacecraft, with supporting vector magnetic field data from surface observatories, were analyzed at dipole latitudes above 55 deg. Although individual satellite passes, at low altitudes, confirm the existence of electrojet currents, neither individual satellite passes nor contours of average delta B are consistent with latitudinally narrow electrojet currents as the principal source of delta B at the satellite. The ratio of delta B magnitudes in positive and negative regions is variable. The characteristics of the negative delta B region indicate a latitudinally broad ionospheric source. Comparison of the surface magnetic disturbance caused by the equivalent current with the measured average surface disturbance shows good agreement except in localized details. Because delta B decreases very slowly with altitude in the positive delta B region, it is not possible to account for this disturbance in terms of ionospheric currents. The contribution to the satellite delta B due to a model electrojet, which reproduced the measured average surface horizontal disturbance, was computed. Definitive identification of all sources of positive delta B is not possible at this time.
Author

N73-30333*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NEAR EARTH MAGNETIC DISTURBANCE IN TOTAL FIELD AT HIGH LATITUDES. 1: SUMMARY OF DATA FROM OGO'S 2, 4, AND 6
R. A. Langel Aug. 1973 36 p refs Submitted for publication
(NASA-TM-X-70442; X-645-73-225) Avail: NTIS HC $4.00 CSCL 08N

Variations in the total (i.e. scalar) magnetic field data from the polar orbiting OGO-2, 4, and 6 spacecraft (altitudes 400-1510 km) are summarized for invariant latitudes above 55 deg. Data from all degrees of magnetic disturbance are included. The data are presented in terms of the quantity delta B(= measured field magnitude minus the field magnitude from a spherical harmonic model of the quiet field). Author

N73-30334*# Techtran Corp., Glen Burnie, Md.
SOME PROBLEMS OF EARTHQUAKES AND THEIR PREVENTION, A. A DISCUSSION OF THE PROBLEMS OF VOLCANIC ACTIVITY, B.
Molnar S. Istvan Washington NASA Dec. 1972 11 p refs Transl. into ENGLISH of "A/ Quelques Problemes des Tremblements de la Terre, de la Prevention Contre Ceux-Ci. B/ Une Discussion sur les Problemes de l'Activite volcanique", unpublished report, Kosice, Czechoslovakia, 4 Apr. 1970 10 p
(Contract NASw-2037)
(NASA-TT-F-15095) Avail: NTIS HC $3.00 CSCL 08G

The subterranean explosion is discussed of petroleum or natural gas provoked by a spark which may cause earthquakes, landslips, and where the tectonic structure of the earth's crust makes it possible, volcanic activity. The free molecules of oxygen and peroxide are of great importance in the case when a qualitative and quantitative discrepancy in the electric charge of the walls of the caves filled with petroleum or gas allows the generation of an electric spark. In subterranean caves containing petroleum and natural gas, the chemical effect of porphyrin catalases or catalases of other heavy metals produces free molecules of oxygen and peroxide, and in addition quinones and polymerisable and polycondensable products including derivates of tar, natural asphalt and natural paraffin. A charge collector system is suggested as a prevention technique. Author

N73-30335# Bureau of Mines, Bartlesville, Okla. Energy Research Center.
BUREAU OF MINES ENERGY PROGRAM, 1972
Bill Linville and John D. Spencer 1973 116 p
(BM-IC-8612) Avail: NTIS HC $8.00

Technologies for improving the production and utilization of petroleum, natural gas, and coal were investigated. Topics included are: oil recovery from tar sands, energy relationships, environmental activities, coal storage, preparation and transportation, and in situ processing. The investigations of clean fluid fuels from coal, gas purification, reservoir properties, fly-ash utilization, and coal mine health and safety are also reported. T.M.R.

N73-30336*# Oslo Univ. (Norway). Inst. of Geophysics.
THE DISTRIBUTION OF ODD NITROGEN IN THE LOWER STRATOSPHERE AND POSSIBLE PERTURBATIONS CAUSED BY STRATOSPHERIC AIR TRANSPORT Final Report
Ivar S. A. Isaksen and Eigil Hesstvedt Washington NASA Aug. 1973 26 p refs
(Grant NGR-52-155-002)
(NASA-CR-2314) Avail: NTIS HC $3.00 CSCL 04A

In the lower stratosphere a significant production of odd nitrogen results from the reaction $N2O + O(D-1)$ yields 2NO. Since the transport is relatively slow, odd nitrogen builds up with a maximum mixing ratio of 2 x 10 to the minus 8th power at 30 Km. Profiles of odd nitrogen, for different latitudes, winter and summer, are computed from one-dimensional transport models. Variations with latitude are small. Horizontal transport is therefore not believed to alter our results significantly. In order to evaluate the effect of odd nitrogen upon the ozone layer, NO(x) profiles are calculated. OH is here a key component, since it converts NO2 to HNO3. In the region where ozone is determined by chemistry rather than by transport (above 25 km), NO2 is found to be relatively abundant. The effect of stratospheric transport on the NO(x) distribution is shown to depend critically upon the height of emission. The effect increases by a factor of 5 or more for a change of flight level from 18 km to 23 km. This strong dependence should be duely considered when future stratospheric transport is discussed. Author

N73-30337*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE DEVELOPMENT OF A STOCHASTIC MODEL OF THE ATMOSPHERE BETWEEN 30 AND 90 km TO BE USED IN DETERMINING THE EFFECT OF ATMOSPHERE VARIABILITY ON SPACE SHUTTLE ENTRY PARAMETERS Ph.D. Thesis - Virginia Polytechnic Inst. and State Univ.
Janet W. Campbell Mar. 1973 152 p refs
(NASA-TM-X-69567) Avail: NTIS HC $9.75 CSCL 04A

A stochasitc model of the atmosphere between 30 and 90 km was developed for use in Monte Carlo space shuttle entry studies. The model is actually a family of models, one for each latitude-season category as defined in the 1966 U.S. Standard Atmosphere Supplements. Each latitude-season model generates a pseudo-random temperature profile whose mean is the

appropriate temperature profile from the Standard Atmosphere Supplements. The standard deviation of temperature at each altitude for a given latitude-season model was estimated from sounding-rocket data. Departures from the mean temperature at each altitude were produced by assuming a linear regression of temperature on the solar heating rate of ozone. A profile of random ozone concentrations was first generated using an auxiliary stochastic ozone model, also developed as part of this study, and then solar heating rates were computed for the random ozone concentrations. Author

N73-30338*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A SIMULATION OF THE SAN ANDREAS FAULT EXPERIMENT
Russell W. Agreen and David E. Smith May 1973 43 p refs Submitted for publication
(NASA-TM-X-70439; X-592-73-216) Avail: NTIS HC $4.25 CSCL 08E

The San Andreas Fault Experiment, which employs two laser tracking systems for measuring the relative motion of two points on opposite sides of the fault, was simulated for an eight year observation period. The two tracking stations are located near San Diego on the western side of the fault and near Quincy on the eastern side; they are roughly 900 kilometers apart. Both will simultaneously track laser reflector equipped satellites as they pass near the stations. Tracking of the Beacon Explorer C Spacecraft was simulated for these two stations during August and September for eight consecutive years. An error analysis of the recovery of the relative location of Quincy from the data was made, allowing for model errors in the mass of the earth, the gravity field, solar radiation pressure, atmospheric drag, errors in the position of the San Diego site, and laser systems range biases and noise. The results of this simulation indicate that the distance of Quincy from San Diego will be determined each year with a precision of about 10 centimeters. This figure is based on the accuracy of earth models and other parameters available in 1972. Author

N73-30339*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GRAN EXPERIMENT
J. C. Morakis, C. Cote, G. Orr, and L. Roach Mar. 1973 39 p
(NASA-TM-X-70437; X-752-73-198) Avail: NTIS HC $4.00 CSCL 08B

A global system for search and rescue was studied to reduce the time lost between a mishap and rescue efforts. The sequence of the GRAN concept proceeds as follows: (1) A distress call is initiated by a survivor and consists of the retransmission of Omega tones and a unique identifying code. (2) Signals are frequency translated through the satellite from UHF to SHF. (3) The received signals are processed in real-time using improved skywave correction and lane ambiguity techniques. The results are processed in geographical coordinates, time of day, and unique ID. This information is then relayed to the closest rescue agent. The Omega system is described, and the satellite/GRAN compatibility is discussed. The program plan and schedule are included. F.O.S.

N73-30340# RAND Corp., Santa Monica, Calif.
ENVIRONMENTAL FACTORS IN THE PRODUCTION AND USE OF ENERGY
S. H. Dole and R. A. Papetti Jan. 1973 88 p refs
(R-992-RF) Avail: NTIS HC $6.50

This report brings together under one cover a discussion of the pertinent environmental factors relating directly to energy production and use. It also makes available a summary of background material on environmental effects that, it is hoped, will be useful to people involved chiefly in other aspects of energy work. The report is divided into sections dealing with the air, the water, and the land each division indicating the sphere of man's natural environment that is most affected by human activities associated with energy production or use. Each subsection deals with an identifiable consequence of energy production or use that has some effect on the environment, whether it be major or minor, established or putative. All the steps in energy production are considered: extraction of raw fuels, processing, transportation, conversion to electrical power or mechanical work, and power transmission. The cost figures given in each subsection are intended only to give indications of the approximate levels of expenditure for pollution abatement to be expected in the United States. Author

N73-30341# Communications Research Centre, Ottawa (Ontario).
THE DIELECTRIC PROPERTIES OF ICE, SNOW AND WATER AT MICROWAVE FREQUENCIES AND THE MEASUREMENT OF THE THICKNESSES OF ICE AND SHOW LAYERS WITH RADAR
G. M. Royer Jun. 1973 35 p refs
(CRC-1242) Avail: NTIS

Investigations are made of (1) the dielectric properties of fresh water ice snow, and water at microwave frequencies and (2) the possibility of using radar to measure the thickness of naturally occurring fresh water ice, and snow layers. It is shown that it is possible to design a FM radar to measure the depths of several meters of ice and dry snow. Author

N73-30342# Ionospharen-Institut Breisach (West Germany).
IONOSPHERE DATA, VERTICAL-ECHO-SOUNDING: FREIBURG, URSI-CODE 131, APRIL 1973 [IONOSPHAEREN-DATEN VERTIKAL-ECHO-LOTUNG: FREIBURG URSI CODE 131, APRIL 1973]
Apr. 1973 44 p In GERMAN and ENGLISH
(Rept-322-F) Avail: NTIS HC $4.25

Daily summaries are presented for vertical echo sounding of the upper atmosphere during April 1973. The data include charts of median values for the E and F regions. Author

N73-30343# Ionospharen-Institut Breisach (West Germany).
IONOSPHERE DATA, VERTICAL-ECHO-SOUNDING: FREIBURG, URSI-CODE 131, MAY 1973 [IONOSPHAEREN-DATEN VERTIKAL-ECHO-LOTUNG: FREIBURG URSI CODE 131, MAI 1973]
May 1973 44 p In GERMAN and ENGLISH
(Rept-323-F) Avail: NTIS HC $4.25

Daily summaries are presented for vertical echo sounding of the upper atmosphere during May 1973. The data include charts of median values for the E and F regions. Author

N73-30344# Ionospharen-Institut Breisach (West Germany).
IONOSPHERE DATA, VERTICAL-ECHO-SOUNDING: FREIBURG, URSI-CODE 131, JUNE 1973 [IONOSPHAEREN-DATEN VERTIKAL-ECHO-LOTUNG: FREIBURG URSI CODE 131, JUNI 1973]
Jun. 1973 44 p In GERMAN and ENGLISH
(Rept-324-F) Avail: NTIS HC $4.25

Daily summaries are presented for vertical echo sounding of the upper atmosphere during June 1973. The data include charts of median values for the E and F regions. Author

N73-30345# Institut d'Aeronomie Spatiale de Belgique, Brussels.
CHEMICAL KINETICS IN THE STRATOSPHERE
G. Brasseur 1973 32 p refs
(AERONOMICA-ACTA-A-118) Avail: NTIS HC $3.75

Ozone is produced by the photodissociation of molecular oxygen and can be destroyed by several reactions involving the nitrogen, hydrogen, oxygen atmosphere. In the lower part of the stratosphere and for photochemical conditions, an important loss of ozone is due to the NOx reactions. Nitric oxide is formed in the stratosphere after dissociation of nitrous oxide by the excited oxygen atom O(1D). The formation of nitric acid is possible by the presence of hydroxyl radicals. Water vapor, methane and molecular hydrogen have an indirect influence on the ozone distribution in the stratosphere. Author

N73-30346*# Scientific Translation Service, Santa Barbara, Calif.
SIMULATION OF THE ROLE OF MICRO-ORGANISMS DURING ORE FORMATION IN LAKES
D. R. Gabe Washington NASA Aug. 1973 28 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (USSR), no. 4, 1971 p 573-586
(Contract NASw-2483)
(NASA-TT-F-15023) Avail: NTIS HC $3.50 CSCL 08G

A modeling approach is proposed for investigating the activity of microorganisms in the ore formation in lakes. This modeling covers the process of oxidation and concentration of manganese and iron in the silt by reproduction under laboratory conditions of secondary silt diagenetic profiles with the manganese and iron conversion microzones. These models are useful for various studies of the normal geochemical activity of the silt microflora. Reproduction of the transition from the deposition of iron to the formation of predominantly manganese ore concentration was accomplished. The leading role of the oxidizing and reducing microbes in this process was also shown. Author

N73-30347*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

MULTISPECTRAL SCANNER DATA PROCESSING ALGORITHM DOCUMENTATION Technical Report, 1 Nov. 1971 - 31 Jan. 1973

M. Gordon and J. Erickson Jul. 1973 80 p Original contains color illustrations

(Contract NAS9-9784)

(NASA-CR-134007; ERIM-31650-149-T) Avail: NTIS HC $6.00 CSCL 05B

The algorithms employed in the current ERIM data processing scheme are described. Methods for suitable visual display of the results of this processing are discussed. Author

N73-30348# Specola Vaticana (Vatican City).

THE ARTIFICIAL NIGHT-SKY ILLUMINATION IN ITALY Vatican Observatory Publications, Vol. 1, No. 4

F. C. Bertiau, E. de Graeve, and P. J. Treanor 1973 21 p refs

Avail: NTIS HC $3.25

Physical considerations related to a highly simplified model atmosphere were investigated. A propagation law of the form, i = a P(A/X + B/sq X) exp(-kX) is studied, in which i is the zenith illumination of the site, a is an economic development factor, P the town population, X the distance of the town, and A,B,k are constants related respectively to the scattering component, the direct beam, and the attenuation of the direct and scattered light by absorption and scattering losses. Using this law, the zenith artificial intensity for Italy and its islands was mapped. Four maps show the percentage of natural light at the center of grid squares of 15 km on a side. A summary map and an intensity contour map summarize these observations. Author

N73-30349*# Stanford Univ., Calif. Inst. for Plasma Research.

ANALYSIS OF THE BACKSCATTER SPECTRUM IN AN IONOSPHERIC MODIFICATION EXPERIMENT

Hongjin Kim Jun. 1973 27 p refs

(Grant NGL-05-020-176; Contract N00014-67-A-0112-0066; ARPA Order 1733)

(NASA-CR-133809; SUIPR-509) Avail: NTIS HC $3.50 CSCL 04A

Predictions of the backscatter spectrum are compared, including effects of ionospheric inhomogeneity with experimental observations of incoherent backscatter from an artificially heated region. Calculations show that the strongest backscatter echo received is not, in fact, from the reflection level, but from a region some distance below (about 0.5 km for an experiment carried out at Arecibo), where the pump wave from a HF transmitter approximately 100 kW) is below the threshold for parametric amplification. By taking the standing wave pattern of the pump into account, asymmetry is explained of the up-shifted and down-shifted plasma lines in the backscatter spectrum, and the several peaks typically observed in the region of the spectrum near the HF transmitter frequency. Author

N73-30350*# Kansas Univ. Center for Research, Inc., Lawrence.

AN EFFICIENT TECHNIQUE FOR DETERMINING APPARENT TEMPERATURE DISTRIBUTIONS FROM ANTENNA TEMPERATURE MEASUREMENTS

John P. Claassen and A. K. Fung Washington NASA Sep. 1973 33 p refs

(Contract NAS1-10048)

(NASA-CR-2310; TR-186-8) Avail: NTIS HC,$3.00 CSCL 14B

A method by which the apparent microwave temperature characteristic of a flat scene is estimated from dual polarized measurements is derived and interpreted. Approximate linear relationships between antenna and apparent temperatures are established by weighting emission components in spherical bands under the assumption that the surface is isotropic. The weighting factors are formed by integrating the antenna pattern functions over these bands. The vector aspect of the formulation is retained to account for the difference between the definition of the antenna polarizations and the polarizations of the emitted fields. The method is largely applicable to the measurement of smooth temperature distributions by an antenna having good spatial resolution of the distributions and is considered efficient for inverting large volumes of measurements. Sample cases are presented and the implications of these cases on remote radiometer observations are discussed. It is shown that cross-coupling occurs between the polarizations of the emitted fields and the polarizations of the antenna. For this reason and because practical antennas have cross-polarized patterns associated with them, it is necessary to conduct measurements at both horizontal and vertical polarizations to realize the inversion. It is also made evident that thorough inversions require that the apparent temperatures be sampled at a sufficient number of points between nadir and zenith. Author

N73-30351*# Michigan Univ., Ann Arbor. High Altitude Engineering Lab.

MEASUREMENTS OF THE MICHIGAN AIRGLOW OBSERVATORY FROM 1971 TO 1973 AT ESTER DOME ALASKA Final Technical Report

K. D. McWatters, J. W. Meriwether, P. B. Hays, and A. F. Nagy Jun. 1973 40 p refs

(Contract NAS8-28592; ORA Proj. 011017)

(NASA-CR-124348) Avail: NTIS HC $4.00 CSCL 04A

The Michigan Airglow Observatory (MAO) was located at Ester Dome Observatory, College, Alaska (latitude: 64 deg 53'N, longitude: 148 deg 03'W) since October, 1971. The MAO houses a 6-inch Fabry-Perot interferometer, a 2-channel monitoring photometer and a 4-channel tilting filter photometer. The Fabry-Perot interferometer was used extensively during the winter observing seasons of 1971-72 and 1972-73 to measure temperature and mass motions of the neutral atmosphere above approximately 90 kilometers altitude. Neutral wind data from the 1971-72 observing season as measured by observing the Doppler shift of the gamma 6300 A atomic oxygen emission line are presented. Author

N73-30352# Bonn Univ. (West Germany). Inst. fuer Astrophysik und Extraterrestrische Forschung.

THE PHASE OF THE 27-DAY VARIATION IN THE UPPER ATMOSPHERE [DIE PHASE DER 27-TAGE-VARIATION IN DER HOCHATMOSPHAERE]

Guenter Paul Bonn Bundesmin. fuer Forsch. und Technol. Apr. 1973 93 p refs In GERMAN; ENGLISH summary

(Contract WRK-49)

(BMFT-FB-W-73-10) Avail: NTIS HC $6.75; ZLDI. Munich 19.15 DM

The reaction time of the upper atmosphere within the 27-day density variation was determined on the basis of drag data of ten satellites in the year 1958 to 1967 in the height range 250 to 760 km. The methods of regression analysis, cross correlation analysis, and spectral analysis were used. The results obtained with these methods are mutually consistent within the statistical error. The regression analysis yields a mean reaction time of 1.71 plus or minus 0.04 days. The factor c in the expression relating exospheric temperature to 10.7 cm radiation was found to depend on the mean solar flux. The data are fitted by a linear dependence with r = 0.99. Author (ESRO)

N73-30353# European Space Research Organization, Paris (France). Space Applications Div.

AN EARTH RESOURCES AIRCRAFT FACILITY

J. Plevin 1973 27 p refs Presented at the Brit. Interplanet. Soc. Symp. on Earth Observation Satellites, London, Apr. 1973 Avail: NTIS HC $3.50

An earth resources aircraft facility (ERAF) is described, fitted with a wide range of advanced remote sensing instruments, e.g.

side-looking radar multispectral scanners and passive microwave radiometers. The facility would provide the central component for the preparatory phase of a European earth resources satellite program. The ERAF missions are considered, and the sensors, sensor support systems, and avionics requirements are discussed. The basic aircraft specifications are given, and the Brequet 1150 Atlantic aircraft is described. The data processing facility for the program is also discussed. ESRO

N73-30354# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, Mar. 1973 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, MARS 1973]
Mar. 1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75
Results of ionospheric and cosmic ray (neutron component) observations at Dourbes (Belgium) are tabulated for March 1973. ESRO

N73-30355# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, Apr. 1973 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, AVRIL 1973]
Apr. 1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75
Results of ionospheric and cosmic ray (neutron component) observations at Dourbes (Belgium) are tabulated for April 1973. ESRO

N73-30356# Plessey Co., Ltd., Havant (England). Electronics Research Lab.
MULTISPECTRAL SCANNING SYSTEMS AND THEIR POTENTIAL APPLICATION TO EARTH RESOURCE SURVEYS. VOLUME 3: DATA PROCESSING
Q. S. Earl and G. Taylor Apr. 1972 271 p refs
(Contract ESTEC-1673/72-EL)
(ERL/R-245; ESRO-CR(P)-233) Avail: NTIS HC $15.75
The automatic processes which serve to make multispectral scanned (MSS) data useful are discussed. The assembly of data from the sensors in a usable form permitting its selection by and distribution to users is described. The means for the exchange of pictures and reference to pictures between the system and user (i.e. image-handling systems) are described and possible developments in the technology are discussed. A statement of operations the user can have performed on MSS data is given together with possible operations and interventions by the user. The computing methods and possible special purpose equipment are discussed together with the integration of the processes in a working system. Finally, features of current systems are outlined. - for Vol. 1 see 92077, Vol. 2 see 92078, Vol. 4 see 92552, Vol. 5 see 92710, and Vol. 7 see 92671 ESRO

N73-30357# Stockholm Univ. (Sweden). Inst. of Meteorology.
A DISCUSSION OF THE CHEMISTRY OF SOME MINOR CONSTITUENTS IN THE STRATOSPHERE AND TROPOSPHERE
Paul Crutzen Mar. 1973 28 p refs Presented at the Symp. on Atmospheric Ozone and Gen. Circulation in the Stratosphere, Arosa, Switz., 21-25 Aug. 1972 Submitted for publication
(AP-12) Avail: NTIS HC $3.50
Atmospheric reactions in the H2O-CH4-o2-o3-NOx system are discussed. In the lower troposphere such reactions may lead to significant production of ozone. Their role in the odd hydrogen balance, especially of the troposphere and lower stratosphere, is discussed. CH3OH may be an intermediate in the oxidation cycle of methane, expecially in the cold stratosphere. Its photodissociation into H2 and CH2O may consequently provide an important source for stratospheric H2. Catalytic photochemical chains of reactions involving NOx and HOx may also lead to tropospheric destruction of ozone. With the aid of model calculations, it is indicated that stratospheric ozone is most sensitive to changes in the adopted lower boundary values of H2O and that an increase in water vapor concentrations in the lower stratopshere will cause some increase in ozone as predicted. Fluctuations in solar radiation flux near 190 nm may cause significant variations in stratospheric ozone concentrations. Author (ESRO)

N73-30358# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
OXIDATION OF NITROGEN AND BALL LIGHTNING
V. L. Martynov 6 Jun. 1973 12 p refs Transl. into ENGLISH from unidentified Russian article
(AD-763146; FTD-HT-23-403-73) Avail: NTIS CSCL 04/1
A summary of ball lightning is presented. The theory that a self sustaining combustion of nitrogen occurs in ball lightning is proposed. The proposed model represents only a rough approximation of the actual phenomenon. T.M.R.

N73-30359# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NUMERICAL EXPERIMENT FOR SOLVING COMPLETE EQUATIONS OF HYDRODYNAMICS
M. R. Pipko 20 Jun. 1973 17 p refs Transl. into ENGLISH from the publ. "Obektivnyi Analiz Meteorologicheskikh Polei" USSR, 1969 p 19-28
(AD-763143; FTD-HT-23-593-73) Avail: NTIS CSCL 04/2
Equations of hydrodynamics for numerical forecasts using small perturbations are reported. An analysis of the problem, in the process of solving the equations, is carried out for the case of an incompressible, homogeneous, inviscid, and divergent atmosphere. Selection of the Eliassen grid and methods for plotting the formations are included. T.M.R.

N73-30360# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
VARIABILITY OF EIGENVECTOR AND EIGENVALUES OF THE CORRELATION MATRICES OF VERTICAL TEMPERATURE PROFILES
V. G. Boldyrev 20 Jun. 1973 13 p refs Transl. into ENGLISH from the publ. "The Interpretation and Use of Satellite Data in the Analysis and Forecasting of Weather" USSR, 1971 p 112-117
(AD-763145; FTD-HT-23-374-73) Avail: NTIS CSCL 04/2
Dependence of eigenvectors having numbers higher than the first on the regional latitude and the nature of the underlying surface was studied. Autocorrelation matrices of the vertical temperature profiles computed for two meridional cross sections were used to calculate the eigenvalues and the eigenvectors. T.M.R.

N73-30361# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE STATISTICAL STRUCTURE OF THE BRIGHTNESS FIELD OF REFLECTED RADIATION IN THE 0.6-0.8 UM SPECTRAL RANGE
V. G. Boldyrev and V. I. Tulupov 18 Jun. 1973 16 p refs Transl. into ENGLISH from an unknown Russian monograph
(AD-763158; FTD-HT-23-372-73) Avail: NTIS CSCL 04/1
There is a sharp reduction of spectral density of reflected radiation beginning in the 700-1000 km wavelength region. Sliding averaging with an averaging interval of about 5000 km was used. In this manner, for all practical purposes only the spatial trend caused by differences in the Sun's altitude at various latitudes was filtered out. Of particular interest is the further filtration of the low-frequency vibrations in order to provide a more detailed explanation of the behavior of the spectrum for the vibrations of reflected radiation for wavelengths less than 700-1000 km. The paper attempts an analysis of this kind based on processing the materials obtained from observations of the radiation reflected from the earth's surface and clouds, conducted by the satellite (Kosmos-121). GRA

N73-30362# New York Univ., N.Y. Dept. of Meteorology and Oceanography.
OCEAN DYNAMICS REMOTE SENSING STUDY Final Report, 21 Jun. 1971 - 30 Jul. 1972
Willard J. Pierson, Jr. Jan. 1973 31 p refs
(Contract N62306-70-A-0075)
(AD-762073; TR-73-3) Avail: NTIS CSCL 08/3
Three of the objectives of the N.Y.U. AAFE program were: (1) to develop improved theories for radar sea return; (2) to define the spectrum of a wind-roughened sea as completely as

possible over a full range of wave numbers; and (3) to apply the wave spectrum to the improved theory for sea return. GRA

N73-30363# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CERTAIN PARAMETERS OF CYCLONIC CLOUD VORTICES
T. P. Popova 8 Jun. 1973 25 p Transl. into ENGLISH from the publ. "The Interpretation and Use of Satellite Data in the Analysis and Forecasting of Weather" USSR, 1971 p 17-31
(AD-763170; FTD-MT-24-375-73) Avail: NTIS CSCL 04/1

Cyclonic cloud vortices differ by the large variety of their shapes and dimensions. But in each cloud vortex it is possible to observe a basic cloud spiral, which looks like a cloud band approximately from 100 to 400 km wide, the curvature of which gradually decreases with distance from the cloud vortex. Analysis of 120 cyclonic cloud vortices, selected from the period of observations from April, 1966, to December 1967, over Europe and Western Siberia, shows that in cloud vortices it is possible to trace from one to several spirals. From the morphological indications it is possible to isolate three basic forms of cyclonic cloud vortices. GRA

N73-30364# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EVALUATION OF THE CHARACTERISTICS OF THE VERTICAL DISTRIBUTION OF MOISTURE IN THE ATMOSPHERE USING SATELLITE MEASUREMENTS
V. G. Boldyrev, A. S. Gurvich, E. P. Dombkovskaya, and T. G. Krasilnikova 18 Jun. 1973 15 p refs Transl. into ENGLISH from an unidentified Russian article
(AD-763286; FTD-HT-23-368-73) Avail: NTIS CSCL 04/1

Measurements of the outgoing thermal radio emission on the (Kosmos-243) artifical earth satellite have made it possible to determine the distribution of the integral water-vapor content in the atmosphere over the oceans. The study shows, on the basis of satellite measurements, that data can be obtained concerning the vertical distribution of specific moisture content as a function of altitude if a priori information in the form of statistical characteristics is used. GRA

N73-30365# Stanford Research Inst., Menlo Park, Calif.
STRATOSPHERIC ELECTRICITY Final Report
Richard D. Hake, Edward Pierce, and William Viezee Apr. 1973 149 p refs
(Contract N00014-72-C-0259; SRI Proj. 1724)
(AD-763471) Avail: NTIS CSCL 04/1

The motivation behind the study described in this report is the possible climatic impact of operating a fleet of supersonic transports (SSTs). The report first summarizes information on the physical properties of the stratosphere and on its gaseous and particulate trace consituents. A critical review of experimental data on stratosphere electrification is then presented. Information is given on profiles of conductivity (positive and negative); small- (cluster-) ion densities (positive and negative); and electric field. Some of the experimental results are shown to be suspect. The more reliable experimental results, obtained between 10 and 30 km, indicate conductivities increasing monotonically with increasing height; electric fields decreasing monotonically as height increases; small-ion densities of the order of thousands per cu cm with a maximum at about 15 km; little space charge; a constant vertical air/earth current; and positive and negative small-ion mobilities. Fine- and larger-scale spatial and temporal variations are superimposed upon the general trend of the results. Simple theory shows that the major phenomena of stratospheric electricity can be mostly explained by considering ion production by cosmic rays alone, and ion loss only by mutual neutralization (recombination). It was concluded that stratospheric electrification is little affected by gaseous constituents, but should be quite responsive to changes in the number density and size distribution of the stratospheric aerosol. (Modified author abstract) GRA

N73-30366# Naval Weapons Lab., Dahlgren, Va.
LIGHTNING PROTECTION DOCUMENTATION
R. Vaselich and J. Dixon 12 Jun. 1973 59 p refs
(AD-763667; NWL-AR-124) Avail: NTIS CSCL 04/1

Approximately two hundred (200) documents on various aspects of lightning theory, instrumentation, and protection are cited as an up-to-date, cross-referenced bibliography which should prove beneficial to others engaged in lightning research. These references were compiled from DDC, NTIS, Engineering Index, Index to Science and Technology, Library of Congress, International Aerospace Abstracts, NASA, and Personal Communications. Author (GRA)

N73-30367*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
ELECTROMAGNETIC RADIATION TRAPPED IN THE MAGNETOSPHERE ABOVE THE PLASMA FREQUENCY Progress Report
Donald A. Gurnett and Robert R. Shaw May 1973 48 p refs
(Contract NAS5-11074; Grant NGL-16-001-043; Contract N00014-68-A-0196-0003)
(NASA-CR-133837; AD-763479; U-of-Iowa-73-13) Avail: NTIS HC $4.50 CSCL 04A

An electromagnetic noise band is frequently observed in the outer magnetosphere by the IMP-6 spacecraft at frequencies from about 5 to 20 kHZ. This noise band generally extends throughout the region from near the plasmapause boundary to near the magnetopause boundary. The noise typically has an intensity of about 10 microvolts/meter. The noise bands often contain a harmonic frequency structure which suggests that the radiation is associated with harmonics of the electron cyclotron frequency. The frequency spacing of these harmonics does not, however, appear to be related to the local electron cyclotron frequency. Possible mechanisms which could explain the generation of this noise are discussed. Author (GRA)

N73-30368# Calspan Corp., Buffalo, N.Y.
EXPLOSIVE TECHNIQUES FOR HIGH ALTITUDE METAL RELEASES Semiannual Report, 1 May 1972 - 30 Apr. 1973
Robert A. Fluegge Griffiss AFB, N. Y. RADC May 1973 14 p
(Contract F30602-72-C-0436; ARPA Order 1649)
(AD-763796; RADC-TR-73-174) Avail: NTIS CSCL 04/1

An experimental and analytical program to determine the effects of shock waves in porous iron is being undertaken. The overall goal is to cause sufficient vaporization such that dense clouds of Fe atoms can be generated. A large, high altitude test chamber and associated equipment have been instrumented for these tests. Initial results look promising. Author (GRA)

N73-30369# Naval Postgraduate School, Monterey, Calif. Dept. of Meteorology.
DEVELOPMENT OF REGIONAL EXTREME MODEL ATMOSPHERES FOR AEROTHERMODYNAMIC CALCULATIONS (2)
Frank L. Martin 1 Jul. 1973 49 p refs
(AD-763671; NPS-51MR73071A) Avail: NTIS CSCL 04/1

In an earlier paper (Model Atmospheres (1)), a procedure was developed for determining the most probable vertical temperature profile associated with the occurrence of 1% global temperature extreme at mandatory-pressure levels at stations in the North American Arctic. The same technique, based upon a variation of the stepwise multiple regression procedure, was employed in the current study. The ensuing multiple regression analysis applied to the geographically and climatologically diverse set of stations of the current study led to realistic estimates of the temperature profiles which were conditionally dependent upon the existence of 1% extreme forcing-level temperature T(J) at previously designated pressure levels P(J). (Modified author abstract) GRA

N73-30370# Environmental Research Inst. of Michigan, Ann Arbor.
PROCEEDINGS OF THE 8TH INTERNATIONAL SYMPOSIUM ON REMOTE SENSING OF ENVIRONMENT, VOLUME 1 Final Report
Jerald J. Cook Oct. 1972 815 p refs Proc. held at Ann Arbor, Mich., 2-6 Oct. 1972 Sponsored by Michigan Univ., NASA, EPA, DOT, Dept. of Interior, Dept. of Agr., AFOSR, NONR, NOAA, TVA
(Grant AF-AFOSR-2372-72; AF Proj. 9751)

(NASA-CR-133784; AFOSR-73-0980TR-Vol-1; AD-761559; ERIM-195600-1-X-Vol-1) Avail: NTIS HC $45.75 CSCL 08/6

These Proceedings contain papers presented at the Eighth International Symposium on Remote Sensing of Environment, held October 2nd through 6th, 1972, on the campus of the University of Michigan. The symposium was conducted by the Center for Remote Sensing Information and Analysis of the Environmental Research Institute of Michigan (formerly the University of Michigan's Willow Run Laboratories) as a part of a continuing program investigating current activities in the field of remote sensing. Presentations include those on the use of this technology by regional governmental units and by federal governmental agencies, as well as various applications in monitoring and managing the earth's resources and man's global environment. Ground-based, airborne, and spaceborne sensor systems and manual and machine-assisted data analysis and interpretation are included. Author (GRA)

N73-30371# Defense Documentation Center, Alexandria, Va.
WATER POLLUTION Report bibliography, Jun. 1963 - Dec. 1972
Jun. 1973 298 p refs
(AD-761980; DDC-TAS-73-26) Avail: NTIS CSCL 13/2

The bibliography comprises citations of unclassified and unlimited reports covering water pollution, from both natural and man-made sources. References primarily deal with causes of pollution, their detection control, treatment and elimination. Computer-generated indexes are Corporate Author-Monitoring Agency, Subject, Title, and Personal Author. Author (GRA)

N73-30372# Wisconsin Univ., Madison. Space Science and Engineering Center.
RESEARCH ON THE OPTICAL STATE OF THE ATMOSPHERE, 1 AUGUST 1971 - 1 JUNE 1972
Michael McClintock, Alden McLellan, and Leaf Turner 30 Nov. 1972 60 p refs
(Contract EPA-68-02-0337)
(PB-220394/1; EPA-R3-72-027) Avail: NTIS HC $3.00

Research is reported on the feasibility of using satellite-based instruments to detect atmospheric pollution. The report, which consists of three papers, investigates the possibility of climactic change from the radiative interference from dust and clouds in the atmosphere; provides an example of satellite detection of global or large-scale atmospheric pollution and a laboratory experiment on the non-lambertian radiative reflection properties of urban areas; and presents a theoretical treatment of electro-magnetic scattering from randomly oriented anisotropic particles with the intent of obtaining information about their shape. Author (GRA)

N73-30373# Oklahoma State Univ., Stillwater.
REMOTE SENSING RESEARCH PROJECT. GLOSSARY OF AERIAL PHOTOGRAPHY AND REMOTE SENSING IN GEOLOGY AND EARTH SCIENCES
Mohamed Abdel-Hady and Hassan Mostafa Dec. 1972 92 p refs
(Grant NSF GF-31866)
(PB-220154/9; IR-3) Avail: NTIS HC $3.00

The glossary includes definitions of 470 terms which are of common use by the photogeologists and the interpreters of remote sensing and aerial photography in their fields of applications in geology and earth sciences. It was compiled to have a standard set of definitions for the technical terms commonly used in aerial photography. Arranged alphabetically, it is the third interim report on the research project "Remote Sensing Techniques in the Arab Republic", and compliments the previous reports with its explanations. (Modified author abstract) (GRA)

N73-30374# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
CHARACTERISTICS OF CARBON BLACK DUST AS A LARGE-SCALE TROPOSPHERIC HEAT SOURCE
William M. Frank Jan. 1973 55 p refs
(Grant NSF GA-32589)
(PB-220642/3; CSU-ATSP-195) Avail: NTIS HC $4.50 CSCL 04B

The paper evaluates the radiation properties of clouds consisting of carbon black particles in aerosol form spread artificially in the atmosphere to absorb solar radiation and hence to create an atmospheric heat source for possible large-scale weather modification. Properties of carbon black are discussed. A method for estimating solar radiation absorbed by clouds developed by Korb and Moller (1962) is applied to study solar absorption and scattering of carbon black dust clouds. The very high energy gain to weight and cost is discussed. The economics of dispersal is also discussed. Author (GRA)

N73-30375# Indian National Scientific Documentation Centre, New Delhi.
THE ANTARCTIC
1971 284 p refs Transl. into ENGLISH of the publ. "Antarktika" Moscow, Nauka, 1965 172 p
(Contract NSF C-466)
(TT-67-59071) Avail: NTIS HC $6.75 CSCL 08F

Contents: geological structure of Enderby Land and the Prince Olav Coast; Nepheline syenite intrusives of Queen Maud Land; geodetic and gravimetric studies in East Antarctica; problem of peneplanation in Antarctica; perimeter of Antarctica and Antarctic ice sheet budget; ionosphere above the south geomagnetic pole during the year of maximum solar activity; frontal zones of the Southern Ocean; causes of electrification of snow crystals during snowstorms; location of the velopause over Antarctica; and medical services in Antarctic expeditions. GRA

N73-30376# Israel Program for Scientific Translations, Ltd., Jerusalem.
DUST IN THE ATMOSPHERE OVER THE ATLANTIC OCEAN
R. V. Abramov 1972 27 p refs Transl. into ENGLISH from the publ. "Usloviya Sedimentatsee v Atlanticheskom Okean" Moscow, Nauka, 1971 p 7-30 Sponsored by NOAA and NSF
(TT-72-50018) Avail: NTIS HC $4.25 CSCL 04B

A wide review of works is presented which analyze the sources and ways of transfer of natural dust precipitating over the Atlantic Ocean, mainly to the north of the Equator. The paper gives an original interpretation of the conditions of dust precipitation. Detailed analysis is made of the role of each group of atmospheric dust in the process of modern sedimentation, as well as the role of volcanic dust in climate formation.
Author (GRA)

N73-30377# General Electric Co., Philadelphia, Pa. Space Div.
DETERMINATION OF THE VIBRATIONAL TEMPERATURE OF N2 IN THE E AND F ATMOSPHERIC REGIONS
Marlyn H. Bortner and Theodore Baurer Jul. 1972 46 p refs Revised
(Contract DASA01-70-C-0082; DNA Proj. NWER-HD-010)
(AD-763749; DNA-3092T) Avail: NTIS CSCL 04/1

Summarizing the results of this effort, the vibrational energy content of atmospheric N2 has been determined through numerical integration of the time-dependent species continuity equations and the species equation of motion. Generalized diffusion through the nonuniform thermosphere was included. Sources of excitation included the reaction of atomic nitrogen with NO, and the quenching of O(singlet D). Loss mechanisms used in the calculations were VT energy transfer to atomic oxygen, and VV exchange to CO2. The results predict a vibrational temperature of about 300 K at 100 km altitude, and less than 1500 K at 300 km, both at noontime, in good agreement with values derived from positive-ion data for a quiet atmosphere and with recent rocket-probe measurements. Author (GRA)

N73-30378# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
ATMOSPHERIC TRANSMITTANCE FROM 0.25 TO 28.5/MICROMETERS COMPUTER CODE LOWTRAN 2
J. E. A. Selby and R. A. McClatchey 29 Dec. 1972 83 p refs
(AD-763721; AFCRL-ERP-427; AFCRL-72-0745) Avail: NTIS CSCL 04/1

A FORTRAN computer program LOWTRAN 2 is described for calculating the transmittance of the atmosphere in the spectral region 0.25 to 28.5 micrometers at a spectral resolution of 20/cm. The program provides a choice of six atmospheric models

covering seasonal and latitudinal variations from sea level to 100 km, two haze models, and accounts for molecular absorption, molecular scattering, and aerosol extinction. Refraction and earth curvature effects are also included. Author (GRA)

N73-30379# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
HEAVY ION INVESTIGATIONS Quarterly Technical Report, 1 Nov. 1972 - 28 Feb. 1973
Richard D. Sharp 20 Mar. 1973 8 p refs
(Contract N00014-73-C-0165; ARPA Order 2246)
(AD-763436; LMSC-D315608) Avail: NTIS CSCL 04/1

This is a program for the analysis of selected data from the ARPA Energetic Ion Mass Spectrometer Experiment on the OV1-18 satellite. This experiment provided the first evidence for energetic magnetospheric ions with m = 4 that have recently been inferred to be O- ions and to be an important new magnetospheric particle population (Shelley et al., 1972). During this quarter, a comparison of the latitudinal position of the energetic O- ions with the inferred location of the plasmapause was made for three magnetic storms in 1969. The results show that the ions lie poleward of that boundary and are not responsible for the direct excitation of SAR-arcs. In the 24 December 1969 storm where detailed ionospheric data are available, the energetic O- ions were found to be located near a steep ionospheric gradient. Plasma instabilities generated at this gradient could be the source mechanism for the acceleration of ambient ionospheric O- ions into the 10-keV range.
Author (GRA)

N73-30380# Inter-American Tropical Tuna Commission, La Jolla, Calif.
APPLICATION OF HIGH RESOLUTION INFRARED AND VISUAL DATA TO INVESTIGATE CHANGES IN THE RELATIONSHIP BETWEEN SEA SURFACE TEMPERATURES AND CLOUD PATTERNS OVER THE EASTERN TROPIC PACIFIC
Merritt R. Stevenson and Forrest R. Miller Jun. 1973 113 p refs
(Contract N00014-72-C-0360)
(AD-763350) Avail: NTIS CSCL 08/10

Results on the application of infrared data from NASA and NOAA satellites for use in the field of fishery oceanography are given. Results of Project Little Window 2 (LW-2) held in the Gulf of California are discussed. Atmospheric attenuation factors are discussed in terms of published research and in terms of the newly acquired field data. A general review of the numerical techniques used for handling infrared data is given. In an application of NIMBUS 4, THIR data in the eastern tropical Pacific, information on the moist marine layer was used to estimate atmospheric attenuation factors, based on curves for model atmospheres. Results of the comparison are discussed in terms of the predicted observed temperature differences. The importance of surface thermal fronts to biota in general and to the tuna fishery in particular, in the eastern tropical Pacific is discussed. Several numerical techniques for producing charts that emphasize thermal gradient features are discussed and results are given for the LW-2 experiment. (Modified author abstract) GRA

N73-30381# Naval Weapons Lab., Dahlgren, Va.
POLE POSITION FOR 1972 BASED ON DOPPLER SATELLITE OBSERVATIONS
Richard J. Anderle May 1973 83 p refs
(AD-763362; NWL-TR-2952) Avail: NTIS CSCL 08/5

The position of the earth's spin axis with respect to the crust was computed on the basis of Doppler satellite observations in 1972 for the fourth consecutive year. The standard error of the determination based on five days of observations was as low as 20 cm during periods when data from 19 stations on three satellites were used in computations. In addition, computation of satellite orbits was performed for isolated time spans dating back to 1964, and changes in latitude residuals were computed for each station for the period 1964-1972; the changes were consistent with the standard error of 10-20 cm/year. Author (GRA)

N73-30382# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
AFCRL ATMOSPHERIC ABSORPTION LINE PARAMETERS COMPILATION Environmental Research Papers
R. A. McClatchey, W. S. Benedict (Maryland Univ.), S. A. Clough, D. E. Burch (Philco-Ford Corp.), R. F. Calfee, K. Fox (Tenn. Univ.), L. S. Rothman, and J. S. Garing 26 Jan. 1973 83 p refs
(AF Proj. 7670)
(AD-762904; AFCRL-TR-73-0096; AFCRL-ERP-434) Avail: NTIS CSCL 07/4

The report describes a compilation of the molecular spectroscopic parameters for a number of infrared-active molecules occurring naturally in the terrestrial atmsophere. The following molecules are included in this compilation: water vapor; carbon dioxide; ozone; nitrous oxide; carbon monoxide; methane; and oxygen. The spectral region covered extends from less than 1 micrometer to the far infrared, and data are presented on more than 100,000 spectral lines. The parameters included in the compilation for each line are: frequency, intensity, half-width, energy of the lower state of the transition, vibrational and rotational identifications of the upper and lower energy states, an isotopic identification, and a molecular identification. A discussion is provided separately for each molecular species, indicating the sources and accuracy of the data and a general discussion of how the data were obtained. Author (GRA)

N73-30383# Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
AERIAL REMOTE SENSING, A BIBLIOGRAPHY
Donald B. Stafford, ed. (Clemson Univ.) Mar. 1973 488 p refs
(PB-220163/0; WRSIC-73-211) Avail: NTIS HC $10.60 CSCL 08F

The report, containing 272 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 50,631 abstracts covering SWRA through December 15, 1972 (Volume 5, Number 24). Author and subject indexes are included. Author (GRA)

N73-30384# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
ANALYSIS OF ACCURACY OF COMPUTATION OF THE HARMONIC GRAVITY ANOMALY COEFFICIENTS
I. G. Vovk Mar. 1973 14 p refs Transl. into ENGLISH from Geod. i Kartografiya (Moscow), no. 8, 1972 p 13-18
(AD-761942; DMAAC-TC-1908) Avail: NTIS CSCL 08/5

The formula describing the basic features of the earth's gravity field is presented in the form of an expansion in spherical functions. The harmonic coefficients of this series are determined from smoothed gravity anomaly values. With a complete gravimetric coverage the accuracy of determination of the harmonic coefficients is dependent only on the accuracy of the numerical method used, while with an incomplete study it depends also on the degree of the errors in determining the values of the smoothed anomalies according to the data available in the area of smoothing. The paper evaluates the effect of these factors on the accuracy of determination of harmonic coefficients by comparing the initial formulas for the computation of the harmonic coefficients of the smoothed and unsmoothed gravity anomalies. GRA

N73-30385# Geological Survey, Denver, Colo.
PRINCIPAL FACTS FOR GRAVITY STATIONS IN UPPER PART OF ARKANSAS VALLEY AREA, COLORADO Final Report
James E. Case 1973 33 p ref
(PB-220865/0; USGS-GD-015) Avail: NTIS HC $3.00 CSCL 08E

Observed gravity values, station locations, terrain corrections, and Bouguer gravity data are provided in tabular form for approximately 1560 gravity stations in the upper Arkansas Valley area, Colorado. GRA

N73-30614 Joint Publications Research Service, Arlington, Va.
LARGE-SCALE FLUCTUATIONS OF THE WATER SURFACE TEMPERATURE IN THE NORTH ATLANTIC
A. I. Ugryumov *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-59580) 23 Jul. 1973 p 12-25 refs Transl.

into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 12-22 (For availability see N73-30612 21-20)

N73-30615 Joint Publications Research Service, Arlington, Va.
EFFECT OF THE FLUCTUATIONS OF THE CARBON DIOXIDE CONCENTRATION ON THE THERMAL REGIME OF THE ATMOSPHERE
L. R. Rakipova and O. N. Vishnyakova *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-59580) 23 Jul. 1973 p 26-36 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 23-31 (For availability see N73-30612 21-20)

N73-30617 Joint Publications Research Service, Arlington, Va.
ZONAL WIND FIELD STRUCTURE IN THE STRATOSPHERE AND LOWER MESOSPHERE OF THE TROPICAL ZONE DURING THE EQUINOXES
L. S. Minyushina *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-59580) 23 Jul. 1973 p 47-58 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 40-49 (For availability see N73-30612 21-20)

N73-30620 Joint Publications Research Service, Arlington, Va.
ICE JAMS ON THE DNIESTER AND SOME PROPOSALS TO PREVENT FLOODING CAUSED BY THEM
V. N. Karnovich and V. I. Sinotin *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-59580) 23 Jul. 1973 p 78-87 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 78-85 (For availability see N73-30612 21-20)
Avail: NTIS

N73-30621 Joint Publications Research Service, Arlington, Va.
WIND-WAVE SPECTRUM AT THE EDGE OF THE ICE
G. K. Zubakin *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-59580) 23 Jul. 1973 P p 88-92 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 95-97 (For availability see N73-30612 21-20)

N73-30622 Joint Publications Research Service, Arlington, Va.
LOW-LEVEL JET STREAMS IN THE BOUNDARY LAYER OF THE ATMOSPHERE
N. I. Novozhilov *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-59580) 23 Jul. 1973 p 93-102 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 105-110 (For availability see N73-30612 21-20)

N73-30912 Joint Publications Research Service, Arlington, Va.
EIGHTH SESSION OF PLANETARY GEOPHYSICAL RESEARCH COMMITTEE REPORTED
Istvan Joo *In its* Transl. on Eastern Europe: Sci. Affairs, No. 349 (JPRS-59825) 6 Aug. 1973 p 3-6 Transl. into ENGLISH from Geod. Kartografia (Budapest), no. 3, 1973 p 206-207 (For availability see N73-30911 21-34)

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N73-30386* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MEASUREMENT SYSTEM Patent
John W. Turner, inventor (to NASA) Issued 10 Jul. 1973 7 p Filed 7 Dec. 1971 Supersedes N72-20407 (10 - 11, p 1474) (NASA-Case-MFS-20658-1; US-Patent-3,745,475; US-Patent-Appl-SN-205675; US-Patent-Class-328-134; US-Patent-Class-328-48; US-Patent-Class-328-129; US-Patent-Class-324-79D) Avail: US Patent Office CSCL 14B

A measurement system is described for providing an indication of a varying physical quantity represented by or converted to a variable frequency signal. Timing pulses are obtained marking the duration of a fixed number, or set, of cycles of the sampled signal and these timing pulses are employed to control the period of counting of cycles of a higher fixed and known frequency source. The counts of cycles obtained from the fixed frequency source provide a precise measurement of the average frequency of each set of cycles sampled, and thus successive discrete values of the quantity being measured. The frequency of the known frequency source is made such that each measurement is presented as a direct digital representation of the quantity measured. Official Gazette of the U.S. Patent Office

N73-30387 National Lending Library for Science and Technology, Boston Spa (England).
A NEW ELECTRIC PRESSURE DIFFERENCE TRANSDUCER
L. Engel 5 Jun. 1973 11 p refs Transl. into ENGLISH from Arch. Tech. Messen (West Germany), v. 428, Sep. 1971 p 183-186
(NLL-Trans-2976-(9022.81)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon CSCL 14B

A description is given of an electrical pressure difference transducer that works on the deflection principle. The transducer consists of a chain of units; the measuring element is a diaphragm spring which is connected to an inductive displacement pick-up. Corrosion resistant membranes seperate the fluid being measured from the spring and pick-up. Spaces between the separating membranes and diaphragm spring are filled with a transmission fluid which transmits pressure to the diaphragm spring. Dynamic response, stability, power requirements, and timing behavior of the transducer are discussed. E.H.W.

N73-30388* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
RF-SOURCE RESISTANCE METERS Patent
Ernest C. Oakley, inventor (to NASA) Issued 31 Jul. 1973 6 p Filed 19 Feb. 1971 Supersedes N72-10378 (10 - 01, p 0054) Sponsored by NASA
(NASA-Case-NPO-11291-1; US-Patent-3,750,016; US-Patent-Appl-SN-116790; US-Patent-Class-324-57R; US-Patent-Class-324-29.5; US-Patent-Class-324-62R; US-Patent-Class-324-95) Avail: US Patent Office CSCL 14B

Several embodiments of RF source resistance measuring devices are disclosed. Common to all embodiments in the feature of the inclusion of at least one variable resistor, and a peak readout meter. In one embodiment, two ganged unloaded potentiometers are employed while another embodiment comprises an automaticnulling RF power bridge circuit with a variable rather than a fixed bridge reference resistance. A third embodiment comprises a calorimeter with a varible rather than a fixed resistor, while in another embodiment attenuator pads with variable resistors are employed.
Official Gazette of the U.S. Patent Office

N73-30389* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
COLLIMATOR OF MULTIPLE PLATES WITH AXIALLY ALIGNED IDENTICAL RANDOM ARRAYS OF APERTURES Patent
Richard B. Hoover and James H. Underwood, inventors (to NASA) Issued 31 Jul. 1973 6 p Filed 30 Jun. 1970 Supersedes N70-35586(08 - 19, p 3540) Continuation-in-part of abandoned US Patent Appl. SN-11220, filed 13 Feb. 1970
(NASA-Case-MFS-20546-2; US-Patent-3,749,911; US-Patent-Appl-SN-51317; US-Patent-Class-250-65R; US-Patent-Class-250-105; US-Patent-Appl-SN-11220) Avail: US Patent Office CSCL 17H

A collimator is disclosed for examining the spatial location of distant sources of radiation and for imaging by projection, small, near sources of radiation. The collimator consists of a plurality of plates, all of which are pierced with an identical random array of apertures. The plates are mounted perpendicular to a common axis, with like apertures on consecutive plates axially aligned so as to form radiation channels parallel to the common axis. For near sources, the collimator is interposed between the source and a radiation detector and is translated perpendicular to the common axis so as to project radiation traveling parallel to the common axis incident to the detector. For far sources the collimator is scanned by rotating it in elevation and azimuth with a detector to determine the angular distribution

of the radiation from the source.
Official Gazette of the U.S. Patent Office

N73-30390* National Research Corp., Cambridge, Mass.
GAUGE CALIBRATION BY DIFFUSION Patent
Frank J. Brock and Frank Feakes, inventors (to NASA) Issued 6 Aug. 1968 7 p Filed 11 Mar. 1966 Sponsored by NASA (NASA-Case-XGS-07752; US-Patent-3,395,565; US-Patent-Appl-SN-533659; US-Patent-Class-73-4) Avail: US Patent Office CSCL 14B

Vacuum gage calibration by diffusing a known quantity of gas through a heated barrier into a gauge is examined. The gas flow raises the pressure in the gauge to known level and is then compared with the gauge's pressure reading.
Official Gazette of the U.S. Patent Office

N73-30391* National Research Corp., Cambridge, Mass.
ULTRAHIGH VACUUM MEASURING IONIZATION GAUGE Patent
Frank J. Brock, inventor (to NASA) Issued 23 Jul. 1968 4 p Filed 27 May 1965 Sponsored by NASA (NASA-Case-XLA-05087; US-Patent-3,394,286; US-Patent-Appl-SN-459407; US-Patent-Class-315-111) Avail: US Patent Office CSCL 14B

The ionization gage described consists of separate ionization and collector regions connected at an exit area with a modulator electrode. In addition to the standard modulation function, the modulator in this location yields a suprising increase in collector current, apparently due to improved focussing and extraction of ions from the ionization region.
Official Gazette of the U.S. Patent Office

N73-30392* General Electric Co., Philadelphia, Pa.
COMPTON SCATTER ATTENUATION GAMMA RAY SPECTROMETER Patent
William E. Austin, inventor (to NASA) Issued 14 Aug. 1973 11 p Filed 3 Mar. 1972 Supersedes N72-25427 (10 - 16, p 2155) Sponsored by NASA (NASA-Case-MFS-21441-1; US-Patent-3,752,986; US-Patent-Appl-SN-231662; US-Patent-Class-250-394; US-Patent-Class-250-518) Avail: US Patent Office CSCL 14B

A gamma ray spectrometer is described for use in intense radiation fields such as those in the vicinity of a rocket engine exhaust. A collimated radiation beam is Compton scattered toward shielded spectrometers to reduce the energy and intensity of the radiation and is energy selective among the spectrometers. The scattering targets are changeable to control the percentage of the radiation scattered. Sum-Compton coincidence techniques are employed for data selection.
Official Gazette of the U.S. Patent Office

N73-30393* Kollsman Instrument Corp., Syosset, N.Y.
RITCHEY-CHRETIEN TELESCOPE Patent
Seymour Rosin and Max Amon, inventors (to NASA) Issued 14 Aug. 1973 5 p Filed 29 Oct. 1971 Supersedes N72-20404 (10 - 11, p 1474) Sponsored by NASA (NASA-Case-GSC-11487-1; US-Patent-3,752,559; US-Patent-Appl-SN-193814; US-Patent-Class-350-55; US-Patent-Class-350-199; US-Patent-Class-350-204; US-Patent-Class-250-203) Avail: US Patent Office CSCL 14B

A Ritchey-Chretien telescope is described which was designed to respond to images located off the optical axis by using two transparent flat plates positioned in the ray path of the image. The flat plates have a tilt angle relative to the ray path to compensate for astigmatism introduced by the telescope. The tilt angle of the plates is directly proportional to the off axis angle of the image. The plates have opposite inclination angles relative to the ray paths. A detector which is responsive to the optical image as transmitted through the plates is positioned approximately on the sagittal focus of the telescope.
Official Gazette of the U.S. Patent Office

N73-30394* National Research Corp., Cambridge, Mass.
APPARATUS FOR ABSOLUTE PRESSURE MEASUREMENT Patent
Richard Hecht, inventor (to NASA) Issued 27 May 1969 8 p Filed 1 Feb. 1967 Sponsored by NASA (NASA-Case-LAR-10000; US-Patent-3,446,075; US-Patent-Appl-SN-613235; US-Patent-Class-73-398) Avail: US Patent Office CSCL 14B

An absolute pressure sensor (e.g., the diaphragm of a capacitance manometer) was subjected to a superimposed potential to effectively reduce the mechanical stiffness of the sensor. This substantially increases the sensitivity of the sensor and is particularly useful in vacuum gauges. An oscillating component of the superimposed potential induced vibrations of the sensor. The phase of these vibrations with respect to that of the oscillating component was monitored, and served to initiate an automatic adjustment of the static component of the superimposed potential, so as to bring the sensor into resonance at the frequency of the oscillating component. This establishes a selected sensitivity for the sensor, since a definite relationship exists between resonant frequency and sensitivity.
Official Gazette of the U.S. Patent Office

N73-30395* Becton, Dickinson and Co., Rutherford, N.J.
VACUUM PROBE SURFACE SAMPLER Patent
Bruce A. Zahlava, inventor (to NASA) Issued 31 Jul. 1973 5 p Filed 30 Dec. 1971 Supersedes N72-21415 (10 - 12, p 1608) Sponsored by NASA (NASA-Case-LAR-10623-1; US-Patent-3,748,905; US-Patent-Appl-SN-214086; US-Patent-Class-73-421.5R; US-Patent-Class-15-415; US-Patent-Class-73-28) Avail: US Patent Office CSCL 14B

A vacuum probe surface sampler is described for rapidly sampling relatively large surface areas which possess relatively light loading densities of micro-organism, drug particles or the like. A vacuum head with a hollow handle connected to a suitable vacuum source is frictionally attached to a cone assembly terminating in a flared tip adapted to be passed over the surface to be sampled. A fine mesh screen carried by the vacuum head provides support for a membrane filter which collects the microorganisms or other particles. The head assembly is easily removed from the cone assembly without contacting the cone assembly with human hands.
Official Gazette of the U.S. Patent Office

N73-30396# National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
ACCURACY IN SPECTROPHOTOMETRY AND LUMINESCENCE MEASUREMENTS
R. Mavrodineanu, ed., J. I. Shultz, ed., and O. Menis, ed. May 1973 257 p refs Conf. held at Gaithersburg, Md., 22-24 Mar. 1972
(NBS-SP-378; LC-73-600066) Avail: SOD $4.85 Domestic Postpaid or $4.50 GPO Bookstore as C13.10:378

The proceedings of a conference on accuracy in spectrophotometry and luminescence measurements are presented. The subjects discussed include the following: (1) basic principles of spectrophotometry, (2) critical factors involved in measurements, (3) instrumental conditions required for accurate measurements, (4) selection, production, and use of standard reference materials, and (5) application of luminescence techniques to specific biochemical problems. For individual titles, see N73-30397 through N73-30414.

N73-30397 National Physical Lab., Teddington (England).
HIGH ACCURACY SPECTROPHOTOMETRY AT THE NATIONAL PHYSICAL LABORATORY
F. J. J. Clarke *In* NBS Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 1-29 refs (For availability see N73-30396 21-14)
(Paper-76A5-728)

The techniques and equipment used at the National Physical Laboratory (NPL) to achieve high accuracy spectrophotometric measurements are described and discussed. Transmittance measurements made with the reference instrument, which is designed specifically to allow separate investigation of the various possible sources of systematic error, processes that are not practicable with commercial spectrophotometers are explained. The investigation of the linearity of the complete photoelectronic system has always been a key factor, and double-aperture devices have been used to monitor the performance of this instrument and its predecessors. Besides instrumentation, the procurement

of material standards of suitable quality is a major limitation of the art, and the types in use at NPL are described, including the recently developed Ceramic Colour Standards. Author

N73-30398 National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
AN ACCURATE SPECTROPHOTOMETER FOR MEASURING THE TRANSMITTANCE OF SOLID AND LIQUID MATERIALS
R. Mavrodineanu *In its* Accuracy in Spectrometry and Luminescence Meas. May 1973 p 31-51 refs (For availability see N73-30396 21-14)
(Paper-76A5-729)

The optical transmittance of solids and liquids as well as the molar absorptivity of various chemical species are parameters of fundamental significance in characterizing these materials. Meaningful transmittance data can be obtained only when the measurements are performed with well-known accuracy and precision. To perform such measurements, a high accuracy spectrophotometer was designed and assembled and is described. This single-beam instrument is composed of a constant radiation source, a monochromator, a sample carriage, an integrating sphere-photomultiplier assembly followed by appropriate electronics, and a read out system consisting of a digital voltmeter and a computer data acquisition and handling, provision. The accuracy of transmittance measurements is determined by the light-addition principle used in conjunction with a two-aperature arrangement. Author

N73-30399 Utrecht State Univ. (Netherlands). Physical Lab.
ABSOLUTE SPECTRORADIOMETRIC MEASUREMENTS
G. A. W. Rutgers *In* NBS Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 53-62 refs (For availability see N73-30396 21-14)
(Paper-76A5-730)

Two general methods for measuring a quantity of radiation emitted from a source are described. One method is by comparing the radiation from the specimen with that emitted by a standard source. The second method is to measure the radiation with a detector calibrated in absolute units. Standard sources of radiation are identified and discussed. Several types of detectors such as the absolute bolometer and the thermopile are reported. Author

N73-30400 National Research Council of Canada, Ottawa (Ontario). Div. of Physics.
ACCURATE MEASUREMENTS OF AND CORRECTIONS FOR NONLINEARITIES IN RADIOMETERS
C. L. Sanders *In* NBS Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 63-79 refs (For availability see N73-30396 21-14)
(Paper-76A5-731)

The methods for accurately measuring photocell linearity are surveyed and assessed. The effect of not measuring photocell linearity under the conditions used in the final apparatus are considered. Some of the conditions necessary for accurate assessment of the nonlinearity under working conditions are specified. The use of the photocell nearity tester to measure and correct for the nonlinearity of various receivers is described. Author

N73-30401 National Bureau of Standards, Washington, D.C. Optical Physics Div.
PHYSICAL PARAMETERS IN HIGH ACCURACY SPECTROPHOTOMETRY
K. D. Mielenz *In its* Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 81-93 refs (For availability see N73-30396 21-14)
(Paper-76A5-732)

The measured apparent transmittance T sub A of a filter or liquid sample depends on the beam geometry in the spectrophotometer. For focused light incident upon the sample, T sub A is different for systems having different f-numbers, and also depends on the state of polarization of the light. These effects are eliminated when the incident light is collimated; in this case T sub A approaches the true transmittance RHO of the sample. Both modes of operation suffer from stray light and interference effects. The former may be reduced significantly by using mirror rather than lens optics, and the latter by suitable choice of the monochromator slit width. A new spectrophotometer based upon the above-mentioned design principles is described. The photometric precision of this instrument is shot-noise limited, permitting measurements to better than .0001 transmittance units. The double-aperature method of testing detector linearity to this level of precision is discussed. The conventional method of finding the nonlinearity correction can be replaced by a curve-fitting procedure giving better precision. Data on detector nonlinearity, and its dependence on wavelength, are presented. Author

N73-30402 National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
LIQUID ABSORBANCE STANDARDS
R. W. Burke, E. R. Deardorff, and O. Menis *In its* Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 95-108 refs (For availability see N73-30396 21-14)
(Paper-76A5-733)

Errors in the measurement of the absorbances of liquid filters result from instrumental and chemical uncertainties. A systematic study of these variables on the absorbance of selected filters is presented. Three types of liquid filters are discussed. These are: (1) individual solutions of high purity compounds, (2) composite mixtures, and (3) aqueous solutions of organic dyes. The accuracy of the absorptivity data is established using calibrated glass filters. The magnitude of the errors arising from spectral bandpass, beam geometry, stray light, internal multiple reflections, and refractive index are delineated. Author

N73-30403 Hartford Hospital, Conn. Clinical Chemistry Lab.
ACCURATE MEASUREMENT OF MOLAR ABSORPTIVITIES
Robert W. Burnett *In* NBS Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 109-115 refs (For availability see N73-30396 21-14)
(Paper-76A5-734)

The key to accurate measurement of molar absorptivities is a thorough understanding of the sources of error which appear throughout the measurement procedure. Sources of determinant error are listed with comments on estimating their magnitude and eliminating them where possible. Sources of random error are discussed as well as the propagation of both random and determinant errors. There is discussion of the need for accurate values of molar absorptivities using examples from clinical chemistry. Finally, the proper use of accurate absorptivity values in the clinical chemistry laboratory is considered. Here, emphasis is on the need for a quality assurance system which includes routine checks on such things as wavelength calibration and photometric accuracy of spectrophotometers, calibration of analytical balances, and quality of incoming reagents. Author

N73-30404 Institute of Medical Sciences, San Francisco, Calif. Research Inst. of Laboratory Medicine.
PROBLEMS ASSOCIATED WITH THE NEED FOR STANDARDIZATION IN CLINICAL SPECTROPHOTOMETRIC AND FLUOROMETRIC MEASUREMENTS
James R. Penton, Graham M. Widdowson, and George Z. Williams *In* NBS Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 117-124 refs (For availability see N73-30396 21-14)
(Paper-76A5-735)

There is a growing demand in clinical chemistry for analyses to be performed in a manner allowing comparisons of results among laboratories and, from time to time, in the same laboratory. Reliable comparability requires adequate procedures of standardization for spectrophotometric and fluorometric instruments and methods. Problems with chemical and instrumental standardization are discussed. For assays where the substance to be measured is available in suitable form, primary chemical standardization is justifiably popular. Relatively unsophisticated instrumentation can be used to compare measurements of unknown samples with such standards. Because primary standards meeting all necessary criteria are not available for many assays of clinical significance, standardization must depend on precision and accuracy of the instrumentation used, and on accurately compiled values of chemical-optical properties for the materials of interest. Author

N73-30405 Pennsylvania Univ., Philadelphia. Dept. of Pathology.
THE ROLE OF SPECTROPHOTOMETRIC STANDARDS IN THE CLINICAL CHEMISTRY LABORATORY
Royden N. Rand *In* NBS Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 125-134 refs Prepared in cooperation with Pa. Hospital (For availability see N73-30396 21-14)
(Paper-76A5-736)

Spectrophotometric measurements, both manual and automated, are extensively used in the clinical chemistry laboratory. At least 1,000,000 such measurements per day on rather diverse equipment are made in this country; yet, few standards exist. Results of intra-lab surveys suggests that performance could be improved. The various ways in which spectrophotometry is used is illustrated and possible errors resulting from nonstandardized instrumentation are discussed. There is pressing need for well defined and easily usable standards for wavelength, photometric accuracy, photometric linearity, stray light, as well as specifications for optical cuvettes. Author

N73-30406 National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
SPECTROPHOTOMETRIC STANDARDS
W. H. Venable, Jr. *In its* Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 135-136 (For availability see N73-30396 21-14)
(Paper-76A5-737)

The development of spectrophotometric standards is discussed. The parameters involved in establishing the standards are: (1) linearity, (2) image shift, (3) reflections, (4) index of refraction, and (5) identification of properties. Author

N73-30407 Institute of Nuclear Sciences, Lower Hutt (New Zealand).
ABSOLUTE SPECTROFLUOROMETRY
W. H. Melhuish *In* NBS Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 137-150 refs (For availability see N73-30396 21-14)
(Paper-76A6-741)

A method of reporting absolute fluorescence spectra is examined. The methods for calibrating spectrometers for absolute spectrofluorometry are: (1) the standard tungsten lamp and (2) the quantum counter method. The methods are examined and the limitations and possible improvements in accuracy are suggested. The criteria for an emission standard are examined and the use of emission standards for calibrating spectrofluorometers is discussed. Author

N73-30408 Washington State Univ., Pullman. Dept. of Chemistry.
ABSOLUTE QUANTUM EFFICIENCIES
G. A. Crosby, J. N. Demas (Virginia Univ.), and J. B. Callis (Wash. Univ., Seattle) *In* NBS Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 151-167 refs (For availability see N73-30396 21-14)
(Grant AF-AFOSR-2207-72)
(Paper-76A6-742)

Recent developments in several areas of chemistry, laser technology, photodetector instrumentation, and calorimetry are surveyed, and their probable impact on the measurement of quantum yields is assessed. Chemical developments include: (1) synthesis and design of new luminescent molecules that could possibly serve as standards, (2) application of improved separation techniques to provide samples of extreme purity, and (3) advances in photochemistry that portend the development of wide-range chemical actinometers. The potential use of lasers in quantum-yield measurements and their advantages over conventional sources for application in both optical and calorimetric techniques are pointed out. New methods of quantum-yield measurements, based on the novel characteristics of laser pump sources, are suggested, including the feasibility of measuring yields under time-resolved conditions and of employing internal standards. Author

N73-30409 Florida Univ., Gainesville. Dept. of Chemistry.
PHOSPHORIMETRY
J. D. Winefordner *In* NBS Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 169-182 refs (For availability see N73-30396 21-14)
(Contract GM-11373-09)
(Paper-76A6-743)

The use of phosphorimetry as method of quantitative chemical analysis is discussed. The limitations of the procedures are defined. The lowering of detection limits by two orders of magnitude by using a rotating capillary sample cell, a more stable excitation-source power supply, and aqueous solvents is reported. The influence of methanol-water mixtures and of sodium halide aqueous solutions on the magnitude of phosphorescence signals from several substances are analyzed. Author

N73-30410 National Institutes of Health, Bethesda, Md.
MEASUREMENTS OF ABSOLUTE VALUES IN BIOCHEMICAL FLUORESCENCE SPECTROSCOPY
Raymond F. Chen *In* NBS Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 183-196 refs (For availability see N73-30396 21-14)
(Paper-76A6-744)

The use of fluorescence spectroscopy for the study of macromolecules such as proteins and nucleic acids is discussed. The four basic quantities to be measured are defined. Fluctuations in the standards used for fluorescence spectroscopy and the effect on the accuracy of the results are analyzed. Techniques for conducting various measurements using standard spectroscopic equipment are described. Author

N73-30411 Louisiana State Univ., New Orleans. Dept. of Chemistry.
NEWER FLUOROMETRIC METHODS FOR THE ANALYSIS OF BIOLOGICALLY IMPORTANT COMPOUNDS
G. G. Guilbault *In* NBS Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 197-202 refs (For availability see N73-30396 21-14)
(Paper-76A6-745)

Fluorometric methods for the analysis of biologically important compounds are discussed. Enzymes such as LDH, alkaline phosphatase, lipase and cholinesterase, and substrates such as glucose, urea and uric acid are analyzed. These methods are based on the production of fluorescence initiated by an enzymic reaction. New reagentless fluorescence methods are described for enzymes and substrates. These methods are highly precise, fast and involve no preparation of reagents. These methods, as adapted to clinical laboratory procedures, are discussed. Author

N73-30412 Hebrew Univ., Jerusalem (Israel). Dept. of Inorganic and Analytic Chemistry.
INORGANIC IONS IN GLASSES AND POLYCRYSTALLINE PELLETS AS FLUORESCENCE STANDARD REFERENCE MATERIALS c18
R. Reisfeld *In* NBS Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 203-225 refs (For availability see N73-30396 21-14)
(Grant NBS-G-103)
(Paper-76A6-746)

The absorption and fluorescence of inorganic glasses and polycrystalline disks doped by heavy metal ions are discussed, and their use as fluorescence standards is evaluated. The advantages of the glass standards over other media is summarized. The glass standards are divided into two groups: (1) glasses doped by trivalent rare earths which have narrow band optical spectra as a result of intraconfigurational transitions, and (2) glasses and polycrystalline disks doped by ions, which have broad spectral bands since the optical spectra originate from interconfigurationally allowed transitions. Optical and physical parameters, including matrix effects, quantum efficiencies, decay characteristics, Stokes' shifts and spin-orbit versus orbit-lattice interactions due to the different transitions are discussed. Group (1) glasses are suitable for use as standards where a narrow well-defined fluorescence range is required, and group (2) glasses are suitable for use as standards whenever a substance with a wide range of fluorescence is measured. Special emphasis will be placed on energy transfer between donor and acceptor ions. Author

N73-30413 Roche Inst. of Molecular Biology, Nutley, N.J.
DEVELOPMENT OF A NEW FLUORESCENT REAGENT AND

ITS APPLICATION TO THE AUTOMATED ASSAY OF AMINO ACIDS AND PEPTIDES AT THE PICOMOLE LEVEL c06
Sidney Udenfriend *In* NBS Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 227-230 refs (For availability see N73-30396 21-14)
(Paper-76A6-747)

Methods for the assay of amino acids and peptides are most important in elucidating the structure of proteins and peptides. In many important areas of research such as in endocrinology, neurobiology, and genetics, methods are needed with sensitivity higher than is available with the widely used colorimetric ninhydrin procedure. Amines react with ninhydrin and phenylacetaldehyde to give a ternary product which is highly fluorescent. The chemistry of that reaction has now been elucidated and the conditions have been modified and improved so that essentially quantitative yields of fluorescent products are formed with all primary amines. The reaction has been automated and is being used as the detecting system for chromatography of amino acids, peptides and amines. Problems concerning the fluorescence instrumentation and the isolation and chromatography of these compounds in the picomole range are discussed. Author

N73-30414 National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
CONSIDERATIONS ON ORGANIC COMPOUNDS IN SOLUTION AND INORGANIC IONS IN GLASSES AS FLUORESCENT STANDARD REFERENCE MATERIAL c06
R. A. Velapoldi *In its* Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 231-244 refs (For availability see N73-30396 21-14)
(Paper-76A6-748)

The use of various organic compounds in solution and inorganic ions in glasses has been investigated as possible fluorescence Standard Reference Materials. Emphasis was placed on measuring physical and chemical parameters such as stability, reproducibilities of absorbance and fluorescence measurements, relative quantum efficiencies as a function of excitation wavelength, etc., for quinine derivatives and selected organic compounds. A brief discussion is included on the use of rare earth and non-rare earth inorganic ions in glasses as standards. Author

N73-30415*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HEATER-MIXER FOR STORED FLUIDS Patent Application
Thomas N. Canning, inventor (to NASA) Filed 11 Aug. 1972 9 p
(NASA-Case-ARC-10442-1; US-Patent-Appl-SN-280032) Avail: NTIS HC $3.00 CSCL 14B

A fluid storage vessel is described for containing cryogenic fluids including an auxiliary chamber within the storage vessel. The auxiliary chamber is connected in fluid communication with the main storage vessel by means of a jet nozzel. The wall of the auxiliary chamber is heat cycled to produce a corresponding expansion and contraction of the fluid within the auxiliary chamber to produce heating and mixing of the stored fluid by means of jetting the expanded fluid to and fro relative to the stored fluid contents of the vessel. NASA

N73-30416*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
THREE-AXIS, ADJUSTABLE LOADING STRUCTURE Patent Application
Edward J. Lynch and Darwyn T. Gray, inventors (to NASA) Filed 16 May 1972 12 p
(NASA-Case-FRC-10051-1; US-Patent-Appl-SN-253725) Avail: NTIS HC $3.00 CSCL 14B

A three-axis, adjustable loading structure is described for resting the soundness of a structure, such as the skin of an aircraft, by applying pressure. The device has three electric drives which permit rapid and accurate measurement of wall angle, horizontal position, and vertical position of the test device. K.M.M.

N73-30417# Joint Publications Research Service, Arlington, Va.
GEOPHYSICAL INSTRUMENTS
15 Aug. 1973 12 p refs Transl. into ENGLISH from Geofiz. App. (Leningrad), no. 49, 1972 p 13-19
(JPRS-59802) Avail: NTIS HC $3.00

Articles are presented on a towed H-magnetometer and a bottom magnetic-variation station. For individual titles, see N73-30418 through N73-30419.

N73-30418 Joint Publications Research Service, Arlington, Va.
A TOWED H-MAGNETOMETER
I. G. Zhuriy and A. Ya. Rotshteyn *In its* Geophys. Instr. (JPRS-59802) 15 Aug. 1973 p 1-5 refs Transl. into ENGLISH from Geofiz. App. (Leningrad), no. 49, 1972 p 13-16 (For availability see N73-30417 21-14)

In measurements of the components of the MPZ (the magnetic field of the earth) on the water surface, magnetometers towed behind a ship in a gondola are used. The component towed magnetometers are at the stage of development and testing (3, 7). A magnetometer is proposed for direct measurement of the horizontal component of the MPZ with oblique stabilization of the MChE of the quantum magnetometer (with rigid fastening of the MChE in the gondola). Author

N73-30419 Joint Publications Research Service, Arlington, Va.
A BOTTOM MAGNETIC-VARIATION STATION
V. S. Shneyer and D. A. Nizyayev *In its* Geophys. Instr. (JPRS-59802) 15 Aug. 1973 p 6-10 refs Transl. into ENGLISH from Geofiz. App. (Leningrad), no. 49, 1972 p 16-19 (For availability see N73-30417 21-14)

An experimental model of a bottom magnetic-variation station (MVS) was designed and fabricated for recording geomagnetic variations in the same frequency-amplitude range as in polar magnetic observatories. The basic units of the station are: a tripod, an orienting device, the station, a protective cone, and a signal device. The bottom MVS was tested in the straits of the Franz Josef Land archipelago. The material obtained was used for investigation of the skin effect in magnetic variations in the sea and for the determination of the electrical conductivity of the rocks of the sea bottom. Author

N73-30420# Joint Publications Research Service, Arlington, Va.
GYRO INSTRUMENTS
8 Aug. 1973 22 p refs Transl. into ENGLISH from Izv. Vuzov, Priborostr. (Leningrad), no. 5, 1973
(JPRS-59740) Avail: NTIS HC $3.25

Articles are presented on: (1) the influence of the elastic deformation of the gimbal suspension on the frequency of the nutational oscillations of a gyroscope; (2) moments acting on a spherical rotor in a magnetic suspension; and (3) a differentiating linear accelerometer. Author

N73-30421 Joint Publications Research Service, Arlington, Va.
INFLUENCE OF THE ELASTIC DEFORMATION OF THE GIMBAL SUSPENSION ON THE FREQUENCY OF THE NUTATIONAL OSCILLATIONS OF A GYROSCOPE
O. I. Ivanov *In its* Gyro Instruments (JPRS-59740) 8 Aug. 1973 1973 p 1-6 Transl. into ENGLISH from Izv. Vuzov, Priborostr. (Leningrad), no. 5, 1973 p 80-84 (For availability see N73-30420 21-14)

Equations of motion of a gyroscope were derived, with consideration of the angular pliability of the basic elements of the gimbal suspension, and a functional dependence was obtained between the frequency of the nutational oscillations of the gyroscope and the elastic properties of the gimbal suspension. Author

N73-30422 Joint Publications Research Service, Arlington, Va.
MOMENTS ACTING ON A SPHERICAL ROTOR IN A MAGNETIC SUSPENSION
V. V. Lebedev and P. I. Chinayev *In its* Gyro Instruments (JPRS-59740) 8 Aug. 1973 1973 p 7-12 ref Transl. into ENGLISH from Izv. Vuzov, Priborostr. (Leningrad), no. 5, 1973 p 85-88 (For availability see N73-30420 21-14)

Moments due to the non-sphericity of a sphere and the dissipation of energy in the material of the rotor were considered. The dependences between the braking moments and precession moments were established, and methods of their practical determination are indicated. Author

N73-30423 Joint Publications Research Service, Arlington, Va.
A DIFFERENTIATING LINEAR ACCELEROMETER
V. M. Subbotin and Yu. .I. Kuznetsov *In its* Gyro Instruments (JPRS-59740) 8 Aug. 1973 1973 p 13-20 refs Transl. into ENGLISH from Izv. Vuzov, Priborostr. (Leningrad), no. 5, 1973 p 95-100 (For availability see N73-30420 21-14)

A diagram of an accelerometer is considered, which makes it possible to obtain the first derivative of the linear acceleration by direct measurement. The operating principle of the instrument is demonstrated. Differential equations of motion and transfer functions of the instrument are obtained, which may be used in the selection of its parameters. Author

N73-30424*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SHAPED SCINTILLATION DETECTOR SYSTEMS FOR MEASUREMENTS OF GAMMA RAY FLUX ANISOTROPY
J. I. Trombka, J. I. Vette, F. W. Stecker, E. L. Eller, and W. T. Wildes Aug. 1973 31 p refs
(NASA-TM-X-70445; X-641-73-230) Avail: NTIS HC $3.75 CSCL 14B

The detection efficiencies of cylindrical detectors for various gamma ray photon angular distributions were studied in the energy range from .10 Mev to 15 Mev. These studies indicate that simple detector systems on small satellites can be used to measure flux anisotropy of cosmic gamma rays and the angular distribution of albedo gamma rays produced in planetary atmospheres. The results indicate that flat cylindrical detectors are most suitable for measuring flux anisotropy because of their angular response function. A general method for calculating detection efficiencies for such detectors is presented. Author

N73-30425*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FORMULATION OF IMAGE QUALITY PREDICTION CRITERIA FOR THE VIKING LANDER CAMERA
Friedrich O. Huck, Daniel J. Jobson, Edward J. Taylor, and Stephen D. Wall Washington Sep. 1973 20 p refs
(NASA-TM-X-2802; L-8928) Avail: NTIS HC $3.00 CSCL 14E

Image quality criteria are defined and mathematically formulated for the prediction computer program which is to be developed for the Viking lander imaging experiment. The general objective of broad-band (black and white) imagery to resolve small spatial details and slopes is formulated as the detectability of a right-circular cone with surface properties of the surrounding terrain. The general objective of narrow-band (color and near-infrared) imagery to observe spectral characteristics if formulated as the minimum detectable albedo variation. The general goal to encompass, but not exceed, the range of the scene radiance distribution within single, commandable, camera dynamic range setting is also considered. Author

N73-30426# Joint Publications Research Service, Arlington, Va.
THE NEW GRK-1 QUARTZ GRAVIMETER
S. A. Vereda, K. Ye. Veselov, Yu. S. Yevdokimov, and L. V. Kalisheva 17 Aug. 1973 5 p refs Transl. into ENGLISH from Prikl. Geofiz. (Moscow), no. 68, 1972 p 153-155
(JPRS-59832) Avail: NTIS HC $3.00

A description is reported of a new high-precision quartz astatic gravimeter designated GRK-1. Author

N73-30427*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MEASUREMENT CAPABILITIES OF A ONE-DIMENSIONAL LDV SYSTEM
William C. Cliff and Charles E. Fuller, III (Remtec, Inc.) Aug. 1973 20 p refs
(NASA-TM-X-64774) Avail: NTIS HC $3.00 CSCL 14B

The capability is investigated of a single component laser Doppler velocimeter (LDV) system for the measurement of three dimensional mean and turbulent flow statistics. Sets of general equations defining the parameters measured by a single component LDV system are derived. Solutions to the equations for different configurations of a single forward scatter LDV system show that three-dimensional mean velocity measurements can be made with a minimum restriction on the precision for detecting the Doppler frequency. Measurements of the three-dimensional cross products and correlation parameters are shown to require a significantly higher precision in the Doppler frequency detection. Author

N73-30428*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AUTOMATICALLY OPERABLE SELF-LEVELING LOAD TABLE Patent Application
John L. Burch, inventor (to NASA) Filed 8 Aug. 1973 21 p (NASA-Case-MFS-22039-1; US-Patent-Appl-SN-386790) Avail: NTIS HC $3.25 CSCL 14B

A self-leveling load table is described which is automatically maintained level by selectively opening and closing a plurality of solenoid valves for inserting and removing air from chambers provided under the table. The table is floated in a fluid by nine air chambers beneath the top of the table. These chambers are open at the bottom and four oppositely located chambers are used for leveling the table by having the air contained therein. Air bearing pendulums are used for selectively energizing solenoid valves which either apply pressurized air to the chamber or evacuate air from the chamber by means of a vacuum source. NASA

N73-30429*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIRECT INTEGRATION TRANSMITTANCE MODEL
V. G. Kunde and W. C. Maguire Jul. 1973 39 p refs Submitted for publication
(NASA-TM-X-70454; X-622-73-258) Avail: NTIS HC $4.00 CSCL 14B

A transmittance model was developed for the 200-2000/cm region for interpretation of high spectral resolution measurements of laboratory absorption and of planetary thermal emission. The high spectral resolution requires transmittances to be computed monochromatically by summing the contribution of individual molecular absorption lines. A magnetic tape atlas of H2O,O3, and CO2 molecular line parameters serves as input to the transmittance model with simple empirical representations used for continuum regions wherever suitable laboratory data exist. The theoretical formulation of the transmittance model and the computational procedures used for the evaluation of the transmittances are discussed. Application is demonstrated of the model to several homogenous path laboratory absorption examples. Author

N73-30430# Communications Research Centre, Ottawa (Ontario).
A DRY INERT-GAS GLOVE BOX FOR THE HANDLING OF HYGROSCOPIC AND CORROSIVE MATERIALS
R. G. Lamont, A. Watanabe, and J. G. Chambers Jun. 1973 19 p refs
(CRC-1244) Avail: NTIS

An inert gas glove box, which was constructed in order to provide a dry atmosphere for the preparation of samples for spectroscopic and laser experiments, is described. The box was designed with two chambers - the main chamber for housing the bulky equipment such as the centrifuge and balance and for carrying out relatively clean operations; and the work chamber for performing operations which produce fumes or otherwise contaminate the atmosphere. A description is also given of the inert-gas drying and flushing system which made it possible to achieve a moisture level of below 1 ppm by volume in the work chamber and 10 ppm in the main chamber. Typical operations involved in the production of samples of rare earth salts dissolved in hygroscopic and corrosive solvents are also described. Author

N73-30431# Istituto Superiore di Sanita, Rome (Italy). Lab. Di Fisica.
A NEW SOLID STATE DETECTOR TO MEASURE ENERGY AND POSITION OF CHARGED PARTICLES
A. Calicchia 29 Apr. 1972 29 p refs In ITALIAN; ENGLISH summary
(ISS-72/7) Avail: NTIS HC $3.50

Solid state position sensitive detectors are described which indicate the energy and the location of the point of impact for charged particles. A summary is presented of the principles of operation and the advantages over other particle counters. Results of measurements with this type counter are included. Author

N73-30432# National Bureau of Standards, Washington, D.C. Inst. for Applied Technology.
SCANNING ELECTRON MICROSCOPE EXAMINATION OF WIRE BONDS FROM HIGH-RELIABILITY DEVICES
Kathryn O. Leedy Aug. 1973 35 p refs
(NBS-TN-785) Avail: SOD HC $0.55 as C13.46:785

An examination with a scanning electron microscope was made of the wire bonds of over 75 high reliability microelectronic devices. The device interconnects were ultrasonically bonded aluminum wires. Of primary interest were the bonds themselves; their appearance and its significance are described. Also described is the appearance of the metallization and the wire. Comments and explanations are given where the phenomena are understood. Although the devices studied had passed preliminary electrical tests and pre-encapsulation visual examinations, many potential reliability problems were identified such as weak bonds, electrical shorts, and contamination. Author

N73-30433# National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
A RIGOROUS CORRECTION PROCEDURE FOR QUANTITATIVE ELECTRON PROBE MICROANALYSIS (COR 2)
Jean Henoc (Centre Natl. d'Etudes de Telecomm.), Kurt F. J. Heinrich, and Robert L. Myklebust Aug. 1973 132 p refs
(NBS-TN-769) Avail: SOD $2.10 as C13.46:769

A rigorous data reduction procedure for quantitative electron probe microanalysis, which avoids simplifications present in conventional schemes, is described. In addition, the program contains a correction for fluorescence due to the continuum, and separate computation of the fluorescent effects of each exciting primary X-ray line. Constants characteristics of elements are stored in a permanent data file, and the constants and parameters needed for the calculation of mass absorption coefficients are contained in a subprogram. These provisions and decision making sections in the development of the fluorescence corrections reduce the required input considerably. Author

N73-30434*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EVALUATION OF A DEVICE FOR IN-FLIGHT DETERMINATION OF SIZE AND DISTRIBUTION OF HAILSTONES
Emilio Alfaro-Bou Washington Sep. 1973 17 p refs
(NASA-TM-X-2817; L-8953) Avail: NTIS HC $2.75 CSCL 14B

A recording instrument (distrometer) for surveying the hail environment aloft was calibrated with single simulated hailstones launched from the hailstone impact simulator. The hailstone manufacture and characteristics, impact simulator, experimental test program, and resulting data are described. Hailstones 1.3, 2.5, 3.8, and 5.1 cm in diameter were impacted on the distrometer at velocities ranging from 20 to 380 m/s. An evaluation of the distrometer based on data from these tests is presented. Author

N73-30435*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A MODIFIED QUADRUPOLE MASS SPECTROMETER WITH CUSTOM RF LINK RODS DRIVER FOR REMOTE OPERATION
Philip W. Tashbar, Daniel B. Nisen, and W. Walding Moore, Jr. Aug. 1973 27 p refs
(NASA-TM-X-64775) Avail: NTIS HC $3.50 CSCL 14B

A commercial quadrupole residual gas analyzer system has been upgraded for operation at extended cable lengths. Operation inside a vacuum chamber for the standard quadrupole nude head is limited to approximately 2 m from its externally located rf/dc generator because of the detuning of the rf oscillator circuits by the coaxial cable reactance. The advance of long distance remote operation inside a vacuum chamber for distances of 45 and 60 m was made possible without altering the quadrupole's rf/dc generator circuit by employing an rf link to drive the quadrupole rods. Applications of the system have been accomplished for in situ space simulation thermal/vacuum testing of sophisticated payloads. Author

N73-30436# Institute of Nuclear Techniques, Krakow (Poland).
MEASUREMENT OF DENSITY PATTERNS OF HYDROMIXTURES BY MEANS OF RADIOMETRIC SCANNING METHOD
A. Michalik Oct. 1972 29 p refs In POLISH
(ITJ-35) Avail: AEC Depository Libraries HC $3.50

Results of research carried out on industrial hydraulic installations are reported. Density patterns were measured by means of a radiometric scanning method. Density distribution of the stowing mixture was measured under the following conditions: flow mean velocity = 4.0 + or - 10%, mean density of the flowing mixture was regulated from 1.10 g/cu cm to 1.90 g/cu cm. Preliminary analysis of about one hundred measured density patterns is described. Author (NSA)

N73-30437# California Univ., Berkeley. Lawrence Berkeley Lab.
OPTICAL WAVELENGTH-MODULATION SPECTROSCOPY
Y. R. Shen Nov. 1972 33 p refs Presented at the 1st Intern. Conf. on Modulation Spectroscopy, Tucson, Ariz., 23-26 Nov. 1972
(Contract W-7405-eng-48)
(LBL-1402; Conf-721136-4) Avail: NTIS

Wavelength - modulation spectroscopy of solids is reviewed. The construction of a wavelength - modulation spectrometer is described and several examples on its applications to solids are given. It is shown that the results of pseudopotential calculations will agree with the experimental observations. The wavelength - modulation spectrometer can also be used to detect with high sensitivity small changes in a spectrum induced by an external perturbation. Author

N73-30438# National Physical Lab., Teddington (England). Div. of Inorganic and Metallic Structure.
FILM AND VIDEO AS THE RECORDING MEDIUM IN ELECTRON MICROSCOPY
K. F. Hale Apr. 1973 7 p
(NPL-IMS-20) Avail: NTIS HC $3.00

With the development of high voltage electron microscopy, it is feasible to carry out in-situ experiments inside the transmission electron microscope to observe changes in microstructure in specimens thick enough to behave like bulk materials. The choice of recording medium lies between film or video. For the particular problem of recording dynamic events, video recording offers a large number of advantages over cine film. These advantages are discussed. The addition of a low light camera with a large image intensification to the microscope greatly extends the scope of the system. ESRO

N73-30439# Defence Research Information Centre, Orpington (England).
IR TECHNOLOGY SHOWS UP DEFECTS WITH HEAT
J. Ahlstroem Apr. 1973 14 p Transl. into ENGLISH from Elteknik Med. Aktuell Elektronik Sweden, v. 12, Dec. 1972, p 16-19
(DRIC-Trans-3179; BR30524) Avail: NTIS HC $3.00

Infrared detectors are classified in two categories: thermal detectors and photodetectors. A number of detectors in each of these catagories are briefly described. The characteristics of infrared radiation and infrared detectors are described, and a number of figures serve to illustrate applications of the detectors. ESRO

N73-30440# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE EFFECT OF CERTAIN PROPERTIES OF GYROS ON THE DYNAMIC STABILITY OF A GUIDED OBJECT
V. G. Vorobev 18 Jun. 1973 10 p refs Transl. into ENGLISH from Izv. Elektrotekhn. Inst. (Leningrad), no. 103, 1971 p 125-128
(AF Proj. 6095)
(AD-763147; FTD-HT-23-666-73) Avail: NTIS CSCL 17/7

The report describes the kinematic properties of a gyroscope and gimbals as they relate to the stability of a guided missile in flight. GRA

N73-30441# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THERMAL STABILIZATION OF THE DIMENSIONS OF PARTS FOR GYRO DEVICES
Yu. A. Toropov 19 Jun. 1973 9 p refs Transl. into ENGLISH from Izv. Elektrotekhn Inst. (Leningrad), no. 103, 1971

p 121-124
(AF Proj. 6095)
(AD-763148; FTD-HT-23-670-73) Avail: NTIS CSCL 17/7

The specific conditions of stabilizing heat treatment are established depending on: (a) quality of material; (b) required mechanical properties; (c) requirements of condition of surface. GRA

N73-30442# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STABILITY OF AMPLITUDE CHARACTERISTICS OF A LASER GYROSCOPE IN A MAGNETIC FIELD
D. K. Mynbaev 2 Jul. 1973 9 p ref Transl. into ENGLISH from Avtomatika i Vychislitelnaya Tekhn. (Leningrad), no. 103, 1971 p 136-138
(AD-763260; FTD-HT-23-671-73) Avail: NTIS CSCL 17/7

The article considers the change in intensity of the counter wave of a laser gyroscope under a constant axial magnetic field. GRA

N73-30443# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
TRANSITION PROCESSES IN A LASER GYROSCOPE DURING THE SWITCHING OF CERTAIN NON-RECIPROCAL ELEMENTS
V. G. Brykov 19 Jun. 1973 9 p ref Transl. into ENGLISH from Izv. Elektrotekhn Inst. (Leningrad), no. 103, 1091 p 141-143
(AF Proj. 6095)
(AD-763284; FTD-HT-23-668-73) Avail: NTIS CSCL 17/7

The threshold of sensitivity of a laser gyroscope is limited by the presence of a zone of capture. One of the methods of increasing the sensitivity of a laser gyroscope is the introduction of the initial pulsations with the help of non-reciprocal elements. GRA

N73-30444# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
UTILIZATION OF THE ZEEMAN EFFECT TO LOWER THE THRESHOLD OF SENSITIVITY OF A LASER GYROSCOPE
D. K. Mynbaev 20 Jun. 1973 8 p ref Transl. into ENGLISH from Izv. Elektrotekhn. Inst. (Leningrad), no. 103, 1971 p 139-141
(AF Proj. 6095)
(AD-763160; FTD-HT-23-669-73) Avail: NTIS CSCL 17/7

The threshold of sensitivity of a laser gyroscope can be lowered by the static displacement of the instrument characteristics. This can be accomplished by using the Zeeman effect. The method includes the imposition of a constant magnetic field onto an active medium. This leads to the appearance of frequency f(O) at a point where the value of the measured angular velocity v = 0. The magnitude and sign of v are determined by comparing the values of the current f(p) and initial f(o) frequencies. The purpose of this article is to study the use of the dependence f(p) in the presence of f(o) upon field intensity H and the parameters of the laser gyroscope. GRA

N73-30445# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE FEASIBILITY OF PRODUCING CONSTANT-SPEED DRIVE WITH THE HELP OF A GYROSCOPE
I. V. Pavlov and I. S. Chulkova 20 Jun. 1973 10 p refs Transl. into ENGLISH from Avtomat. Vychisl. Tekh. (Riga), no. 103, 1971 p 110-113
(AF Proj. 6095)
(AD-763256; FTD-HT-23-672-73) Avail: NTIS CSCL 17/7

It is shown that in order to solve problems requiring constancy of rotation rate of a certain output axle, precessional movement of a free gyroscope can be used relative to the external axis of the gimbals. An analytical study is made of a device in which the salient feature lies in the fact that substantial moments of external forces act along the external axis, relative to the external axis of the gimbals. The value of the nutational variations of the gyroscope determines the error in the operation of the entire system as far as the requirement for assuring constancy in the rate of movement of the gyroscope. Coefficients are obtained which allow for an indirect evaluation of the parameters of the nutational variations according to the value of the moments themselves. D.L.G.

N73-30446# Illinois Univ., Urbana. Coordinated Science Lab.
THE DESIGN OF AN INTEGRATED AIRCRAFT INSTRUMENTATION DISPLAY SYSTEM UTILIZING A PLASMA DISPLAY/MEMORY UNIT
Michael Lewis McMahan May 1973 99 p refs
(Contracts N00014-67-A-0305-0021; DAAB07-67-C-0199)
(AD-763599; R-613; UILU-ENG-73-2215) Avail: NTIS CSCL 01/4

Background information that was used as the basis for the design specification of a generalized display processor is presented. Included are a review of state of the art airborne computer systems, a study of modern aircraft information display philosophy, and finally the development of a generalized instrumentation system architecture. A digital systems model for flat-panel matrix displays with inherent memory is introduced and one such display technology, the plasma display/memory panel is described. The design of a generalized display processor which will interface with the airborne CPU and a semi-parallel plasma panel configuration is also described. GRA

N73-30447# Michigan State Univ., East Lansing. Dept. of Chemistry.
DESIGN AND CONSTRUCTION OF A PHOTOIONIZATION MASS SPECTROMETER. 1: VACUUM SYSTEM AND SAFETY INTERLOCKS
E. J. Darland and G. E. Leroi Jun. 1973 47 p refs
(Contract N00014-68-A-0109-0009; NR Proj. 014-503)
(AD-763685; TR-10) Avail: NTIS CSCL 07/4

The report deals with the engineering considerations regarding the rather elaborate vacuum system required to do spectroscopy in the high energy (windowless) vacuum ultraviolet region, and the ancillary protective interlock system which has been designed to forestall damage to the instrument should one of the utilities fail. The specific choices of mechanical and diffusion pumps, baffles, automatic and manual valves, and other components of the several vacuum sub-systems are delineated, and the description of the safety interlock system includes schematic diagrams of the logic and control electronics. (Modified author abstract) GRA

N73-30448# Honeywell, Inc., Minneapolis, Minn.
ENERGY/ENERGY RATE METER FOR ENERGY MANAGEMENT IN FLIGHT Final Report
D. C. Sederstrom, N. R. Zagalsky, and R. C. McLane Feb. 1973 111 p refs
(Contract N00014-72-C-0194)
(AD-763450; F2039-FR) Avail: NTIS CSCL 01/4

A 14-month program is described which culminated in fabrication and limited flight tests of a cockpit meter instrumentation system displaying aircraft specific energy and energy rate (specific excess power). Detailed account is given of the analysis and design processes, including man-in-the-loop hybrid simulation and display, through which the meter and its uses were developed. Preliminary flight test results are also cited. Author (GRA)

N73-30449# Mitre Corp., McLean, Va.
AUTOMATIC TARGET CLASSIFICATION: INITIAL REPORT
W. T. Bisignani 20 Apr. 1973 62 p refs
(Contract F19628-73-C-0001)
(AD-763493) Avail: NTIS CSCL 17/1

The report presents pertinent background information and suggests investigatory approaches and techniques in the areas of data analysis, feature extraction, and pattern recognition that will aid in achieving the classification program objectives. The major objective of the program is to classify single and multiple ground vehicles and aircraft, initially concentrating on, but not limitied to, acoustic data generated by the target(s). The key to solving the classification problem is the investigator's ability to determine those features or attributes associated with a target which will allow discrimination between different targets. GRA

N73-30450# General Electric Co., Wilmington, Mass. Aerospace Instrument Programs.
INTEGRATED ENGINE INSTRUMENT SYSTEM Final

Technical Report, on Phase 2, 4 Jun. 1971 - 3 Oct. 1972
Richard L. Skovholt, Fred P. Johnson, Walter A. Doerle, Robert E. Glusick, Martin Fine, and Robert R. Merritt Oct. 1972 206 p refs
(Contract N62269-71-C-0331)
(AD-763440; DF72AEE173) Avail: NTIS CSCL 21/5

The document is the Final Report for Phase 2 of the Integrated Engine Instrument System (IEIS) Program. This phase is primarily concerned with developing equipment that will interact with the display generator and display terminal developed under Phase 1 of the program so that various display formats can be generated under a variety of situations. Therefore, typical IEIS display information will be presented and can be controlled and responded to by the pilot. The primary source of data for the various displays is a scenario contained in a cassette tape recorder which is used as a means of mass storage. Interaction with this scenario is primarily via an operator keyboard. The task of generating the information on the scenario has been the result of display engineering and information analysis activities. (Modified author abstract) GRA

N73-30451# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
MINUTEMAN 3 TOXIC VAPOR DETECTOR Final Report, Jun. 1971 - Mar. 1973.
W. W. Bursack, R. P. Keller, W. A. Harris, and W. E. Anderson Jun. 1973 162 p refs
(Contract F04611-71-C-0059)
(AD-763799; HONEYWELL-12658-FR2; AFRPL-TR-73-41) Avail: NTIS CSCL 14/2

A survey was made of candidate methods for detection and measurement of liquid propellant leakage (monomethylhydrazine and nitrogen dioxide) in the Minuteman III environment. A feasibility demonstration was made of a new concept for a toxic vapor detector, and a breadboard model was designed, fabricated, and evaluated. The design approach and evaluation program are described. The toxic vapor detector performs a continuous sequence of measurements by virtue of self-contained digital logic circuitry. Real-time measurements are made over a range of 0.2 to 100 ppm for monomethylhydrazine and 5 to 500 ppm for nitrogen dioxide. Readouts include visual displays, voltages, and audio/visual alarms. Testing showed that the toxic vapor detector does not respond to specified background gases including internal combustion engine exhaust. The tests revealed that atmospheric reactions may take place between the propellant gases and certain of the background gas (e.g., nitrogen dioxide in the presence of an easily oxidized compound). The measurement sequence can involve the detection of products resulting from propellant-atmosphere reactions, and it does involve measurement of argon whose fixed concentration in the atmosphere provides a continuous, self-calibration feature. A development program involving an electric field ion pump for maintaining this vacuum is described. (Modified author abstract) GRA

N73-30452# Singer Co., Glendale, Calif. Librascope Div.
PROJECT REPORT FOR THE MOVING IMAGE RECONNAISSANCE DISPLAY Final Report
William S. Oakleu Griffiss AFB, N. Y. RADC May 1973 76 p refs
(Contract F30602-71-C-0327)
(Ad-763789; RADC-TR-73-104) Avail: NTIS CSCL 01/3

The report contains the results of a study program designed to develop techniques for creating a moving image reconnaissance display. The display is to be generated from downward looking line scan sensor inputs. The study included construction of a breadboard unit which is described in the report. Author (GRA)

N73-30453# Baird-Atomic, Inc., Bedford, Mass.
IMPROVEMENT OF OPTICAL EFFICIENCY OF LUMINESCENE OF A FLAME PHOTOMETRIC DETECTOR Final Report
Dec. 1972 43 p refs
(Contract EPA-EHSD-71-2)
(PB-220480/8; EPA-R2-73-193) Avail: NTIS HC $3.00 CSCL 13B

A project was initiated with principal objective being to increase the optical efficiency of the flame photometric detector for the detection of SO2. Two routes were explored. First, the spatial distribution of sulfur and background emissions were plotted to establish regions of greatest signal/background. Second, multi-slits were constructed to match the structured sulfur emission and allow background subtract. The spatial studies of sulfur and background emission demonstrated that the optimum signal/background is obtained below the geometric center of the standard burner. The distribution suggested use of a monochromator with horizontal entrance slit rather than a filter. A study of the line emission of sulfur demonstrated that multiple slits could be constructed which would both increase specificity for sulfur and increase the usable signal. Using multi-slits in the non-differential mode, the final sensitivity was about an order of magnitude greater than the comparison standard instrument. GRA

N73-30318 Joint Publications Research Service, Arlington, Va.
TECHNICAL MEDIA FOR OBTAINING, DELIVERING AND PROCESSING IMAGES TAKEN FROM SPACE
In its Meeting of the Sov.-Am. Working Group on Remote Sensing of the Nat. Environment from Space (JPRS-59739) 8 Aug. 1973 p 3-15 refs Transl. into ENGLISH from the publ. "Vstrecha Sovetsko-Amerikanskoy Rabochey Gruppy po Issledovaniyu Okruzhayushchey Sredy iz Kosmosa" Moscow, Acad. of Sci. USSR, 1973 (For availability see N73-30317 21-13)

N73-30763* Arizona Univ., Tucson.
NARROW-BAND PHOTOMETRY OF THE GALILEAN SATELLITES
Willem Wamsteker *In its* Commun. of the Lunar and Planetary Lab., Vol. 9, Pt. 3 1972 p 171-177 refs (For availability see N73-30761 21-29)
(LPL-Commun-167) CSCL 14E

N73-30786* Techtran Corp., Glen Burnie, Md.
PHOTOGRAPHIC PHOTOMETRY OF VARIABLE STARS
P. N. Kholopov *In its* Methods of Investigating Variable Stars (NASA-TT-F-797) Jul. 1973 p 64-84 refs Transl. into ENGLISH from the publ. "Metody Issledovaniya Peremennykh Zvezd" Moscow, Nauka, 1971 p 91-116 (For availability see N73-30783 21-30)
CSCL 14E

N73-30788* Techtran Corp., Glen Burnie, Md.
USE OF PHOTOELECTRONIC IMAGE FORMATION DEVICES (ELECTRON PHOTOGRAPHY, ELECTRON OPTICAL CONVERTERS, TELEVISION)
V. V. Prokofyeva *In its* Methods of Investigating Variable Stars (NASA-TT-F-797) Jul. 1973 p 124-145 refs Transl. into ENGLISH from the publ. "Metody Issledovaniya Peremennykh Zvezd" Moscow, Nauka, 1971 p 167-198 (For availability see N73-30783 21-30)
CSCL 14E

N73-30790* Techtran Corp., Glen Burnie, Md.
PHOTOMETRIC SYSTEMS
V. L. Straizius *In its* Methods of Investigating Variable Stars (NASA-TT-F-797) Jul. 1973 p 167-205 refs Transl. into ENGLISH from the publ. "Metody Issledovaniya Peremennykh Zvezd" Moscow, Nauka, 1971 p 225-279 (For availability see N73-30783 21-30)
CSCL 14E

N73-30791* Techtran Corp., Glen Burnie, Md.
PHOTOMETRIC STANDARDS
A. S. Sharov *In its* Methods of Investigating Variable Stars (NASA-TT-F-797) Jul. 1973 p 206-225 refs Transl. into ENGLISH from the publ. "Metody Issledovaniya Peremennykh Zvezd" Moscow, Nauka, 1971 p 280-306 (For availability see N73-30783 21-30)
CSCL 14E

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; reliability; drafting; and materials fabrication, handling, and inspection.

N73-30454 National Lending Library for Science and Technology, Boston Spa (England).
FRICTION AND LUBRICATION IN STEEL WIRE DRAWING
Yuzaburo Torii and Itami Seisakusho Apr. 1973 17 p Transl. into ENGLISH from Junkatsu (Tokyo), v. 15, no. 1, 1970 p 55-61
(NLL-RTS-7851) Avail: Natl. Lending Library, Boston Spa, Engl.: £1.70 or 6 NLL photocopy coupons

The modernization of the successive drawing machine and the improvements made theron, following the increased scale of steel wire production, have been described. The progress in steel wire coating and subsidiary lubrication seems to have been stabilized in recent years. In the structure of wire drawing machines, the problems such as increasing machine friction in successive drawing and the consequent heat problems have also/been solved. Author

N73-30455 National Lending Library for Science and Technology, Boston Spa (England).
DETERMINATION OF THE SHEAR DRAG IN THE LIVE FLANGES DURING H-BEAM ROLLING
N. A. Chelyshev and A. I. Prokopev [1973] 11 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), no. 12, 1972 p 107-110 In ENGLISH and RUSSIAN
(NLL-M-21639-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

From analysis of the numerous pass designs currently in use at various works and templates sampled during the rolling of beams, a relationship was obtained for determining the height deformation ratio per pass in the live flange during the production of various sections. Apart from the speed conditions in the beam passes, the relationship also takes into account the manner in which the lateral flange and web deformations and rolling temperature are related. The relationship obtained is based on extensive practical experiments and can be recommended for H-beam roll pass design calculations. Author

N73-30456 National Lending Library for Science and Technology, Boston Spa (England).
PROJECTION WELDING: TECHNIQUE AND REQUIREMENTS
M. Evrard and R. Metz [1973] 49 p refs Transl. into ENGLISH from Soudage Tech. Connexes (France), May-Jun. 1969 p 207-227 In ENGLISH and FRENCH
(NLL-M-23048-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 5 NLL photocopy coupons

A program of investigation and experiment was undertaken to determine the technique and requirements for projection welding. Projection welding is a most modern form of resistance welding. It has numerous applications and its many advantages arouse ever-increasing interest on the part of users, particularly as regards the assembly of components in moderately large and large batches. Above all it emerges as the method which enables simultaneous formation of several distinct welds by means of a single electrode with a large active surface area. The nomograms of settings established give to the user the possibility of choosing settings as a function of qualities wished to obtain. The tests have also shown the importance of obtaining a rate of collapse as high as possible and, in this regard, all the means enabling this rate to be increased can have only a beneficial effect on the characteristics of the assemblies. Author

N73-30457* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FASTENER STRETCHER Patent
Joseph W. OConnor and Victor C. Orem, inventors (to NASA) Issued 31 Jul. 1973 7 p Filed 9 Apr. 1971 Supersedes N71-34422 (09 - 21, p 3432)
(NASA-Case-GSC-11149-1; US-Patent-3,749,362; US-Patent-Appl-SN-152849; US-Patent-Class-254-29A; US-Patent-Class-81-57.38; US-Patent-Class-29-452) Avail: US Patent Office CSCL 13E

A description is given of a fastener stretcher used to apply a substantial pure axial tensile force to a structural bolt or similar fastening element. The system is comprised of a pair of telescoping elements, one of which is temporarily secured to the bolt. By spreading the telescoping elements axially, the bolt is tensioned axially to permit a nut or the like to be threaded with a minimum of torque; when the elements are then removed from the bolt, the axial forces on the bolt are taken up by the nut to retain the bolt in its stressed state.
Official Gazette of the U.S. Patent office

N73-30458* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LOW MASS ROLLING ELEMENT FOR BEARINGS Patent
Richard J. Parker, inventor (to NASA) Issued 7 Aug. 1973 4 p Filed 24 Nov. 1971 Supersedes N72-20464 (10 - 11, p 1482)
(NASA-Case-LEW-11087-1; US-Patent-3,751,123; US-Patent-Appl-SN-201904; US-Patent-Class-308-193; US-Patent-Class-308-188) Avail: US Patent Office CSCL 13I

Low mass rolling elements for bearings having a high fatigue strength and high resistance to flexure fatigue are reported. The elements have a lightweight core with a hollow center or is made of a low density material. The core is plated to provide a hard surface. Author

N73-30459* Bendix Corp., Davenport, Iowa. Instruments and Life Support Div.
DUAL STAGE CHECK VALVE Patent
David E. Whitten, inventors (to NASA) Issued 31 Jul. 1973 4 p Filed 10 Dec. 1971 Supersedes N72-21483 (10 - 12, p 1618) Sponsored by NASA
(NASA-Case-MSC-13587-1; US-Patent-3,749,123; US-Patent-Appl-SN-206698; US-Patent-Class-137-516.27; US-Patent-Class-137-535) Avail: US Patent Office CSCL 13K

A dual stage seat valve head arrangement is described which consists of a primary sealing point located between a fixed orifice seat and a valve poppet, and a secondary sealing point between an orifice poppet and a valve poppet. Upstream of the valve orifice is a flexible, convoluted metal diaphragm attached to the orifice poppet. Downstream of the valve orifice, a finger spring exerts a force against the valve poppet, tending to keep the valve in a closed position. The series arrangement of a double seat and poppet is able to tolerate small particle contamination while minimizing chatter by controlling throttling or metering across the secondary seat, thus preserving the primary sealing surface. Official Gazette of the U.S. Patent Office

N73-30460* Denver Univ., Colo.
METAL SHEARING ENERGY ABSORBER Patent
Richard J. Fay and Edward P. Wittrock, inventors (to NASA) Issued 31 Jul. 1973 4 p Filed 28 Dec. 1971 Supersedes N72-20465 (10 - 11, p 1482) Sponsored by NASA
(NASA-Case-HQN-10638-1; US-Patent-3,749,205; US-Patent-Appl-SN-212977; US-Patent-Class-188-1C; US-Patent-Class-297-386) Avail: US Patent Office CSCL 13I

A metal shearing energy absorber is described. The absorber is composed of a flat thin strip of metal which is pulled through a slot in a cutter member of a metal, harder than the metal of the strip. The slot's length, in the direction perpendicular to the pull direction, is less than the strip's width so that as the strip is pulled through the slot, its edges are sheared off, thereby absorbing some of the pulling energy. In one embodiment the cutter member is a flat plate of steel, while in another embodiment the cutter member is U-shaped with the slot at its base.
Official Gazette of the U.S. Patent Office

N73-30461*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
BIMETALLIC FLUID DISPLACEMENT APPARATUS Patent Application
Thomas N. Canning, inventor (to NASA) Filed 11 Aug. 1972 11 p

(NASA-Case-ARC-10441-1; US-Patent-Appl-SN-280029) Avail: NTIS HC $3.00 CSCL 13K

Stirring and heating of stored gases and liquids is accomplished by using the deformation of a bimetallic structure which deforms significantly when heated. The deformation is used to effect gradual or impulsive motion of a piston, vane, wire, or diaphram for displacement of the fluid. The heated bimetallic is also employed for heating the stored fluid. NASA

N73-30462*# Sperry Rand Corp., Huntsville, Ala. Space Support Div.

AN IMPROVED SYSTEM FOR ENHANCING TOOL EXCHANGE CAPABILITIES OF A PORTABLE WRENCH Patent Application

Ray E. Marlow, inventor (to NASA) Filed 9 Aug. 1973 25 p Sponsored by NASA

(NASA-Case-MFS-22283-1; US-Patent-Appl-SN-387095) Avail: NTIS HC $3.25 CSCL 13I

The system is characterized by a sleeve telescopically received by the housing of a wrench motor and a pressure-responsive catch supported by the sleeve for alternately grasping and releasing tools. It is coaxially aligned with the wrench and seated within a tool receptacle. NASA

N73-30463*# AiResearch Mfg. Co., Phoenix, Ariz.

PRELIMINARY DESIGN OF A MINI-BRAYTON COMPRESSOR-ALTERNATOR-TURBINE (CAT) Final Report

12 Mar. 1973 103 p

(Contract NAS3-16739)

(NASA-CR-133810; APS-5440-R) Avail: NTIS HC $7.25 CSCL 13I

The preliminary design of a mini-Brayton compressor-alternator-turbine system is discussed. The program design goals are listed. The optimum system characteristics over the entire range of power output were determined by performing a wide-range parametric study. The ability to develop the required components to the degree necessary within the limitations of present technology is evaluated. The sensitivity of the system to various individual design parameters was analyzed. Author

N73-30464*# Massachusetts Inst. of Tech., Cambridge.

SOME PROBLEMS AND PROSPECTS FOR MARINE TRANSPORTATION OF OIL IN THE 1970S

Zenon S. Zannetos Mar. 1973 21 p refs Presented at the Energy: Demand, Conserv. and Institutional Probl. Conf., Cambridge, Mass., 12-14 Feb. 1973

(Grant NGL-22-009-309)

(NASA-CR-133854; Rept-649-73) Avail: NTIS HC $3.25 CSCL 05C

The problems associated with, and the financial resources required for ocean transportation of petroleum in the 1970s are discussed in terms of the energy crisis. Spot rate fluctuations for tankers are examined along with the financial requirements for ocean transportation. F.O.S.

N73-30465# Oak Ridge Y-12 Plant, Tenn.

APOLLO LUNAR SAMPLE RETURN CONTAINER

F. D. Mundt, J. M. Schreyer, and W. E. Wampler 16 Feb. 1973 88 p

(Contract W-7405-eng-26)

(Y-1867) Avail: NTIS HC $5.45

A description is given of the design and manufacture of Apollo lunar sample return containers (ALSRC), and their associated sample collection devices. The containers were successful in providing adequate storage and protection for lunar samples and maintained these samples in a near-lunar environment during their travel to the earth. Author

N73-30466# United Kingdom Atomic Energy Authority, Harwell (England).

TECHNIQUE FOR WELDING SMALL REFRACTORY METAL CAPSULES

M. J. Moreton-Smith and R. G. Taylor Nov. 1972 9 p

(AERE-R-2544) Avail: AEC Depository Libraries; HMSO 50p; PHI $2.15

A technique is described for welding refractory metal capsules under a controlled atmosphere. High-integrity welds have been obtained with capsules of TZC molybdenum alloys. The technique has also been shown to be suitable for stainless steel. Author (NSA)

N73-30467# Bendix Corp., Kansas City, Mo.

CABLE FABRICATION AND ENCAPSULATION, FY73-1 Quarterly Report

T. J. Husby Feb. 1973 27 p

(Contract AT(29-1)-613)

(BDX-613-775) Avail: NTIS

Research and process development are reported for: processes to control encapsulant wicking in vacuum potted multiconductor cable ends; string-pulling machine fabrication and initial evaluation; redesign and modification of a Bendix-fabricated cable-wire identification device; solder sleeve processing; and ultrasonic soldering-iron evaluation for a specific application. Author

N73-30468# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).

ANALYSIS OF A STRESS-TIME HISTORY MEASURED UNDER OPERATIONAL CONDITIONS BY MEANS OF POWER SPECTRAL DENSITY [BESCHREIBUNG EINER IM FAHRBETRIEB GEMESSENEN BEANSPRUCHUNGS-ZEIT-FUNKTION MIT HILFE DER SPEKTRALEN LEISTUNGS-DICHTE]

O. Buxbaum Oct. 1972 29 p refs In GERMAN

(LBF-TB-102) Avail: NTIS HC $3.50

Stresses proportional to the vertical movement of a rear wheel suspension of a motor car were recorded continously on magnetic tape during drives of 1765 km over roads of varying conditions. For analysis, it can be assumed that the portion of stresses due to driving maneuvers is very small compared to that due to road roughness. Therefore, to regard the measured stress-time history as random vibration, which can be approximated by stationary Gaussian processes for short periods of time is justified. Density function of RMS values, power spectrum and its variation versus time, irregularity factors, as well as cumulative frequency distribution of level crossings are presented. Author (ESRO)

N73-30469# Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany).

ENVIRONMENTAL TESTS ON DRALLRAD DR 20-6-ZKM

Hans Holger Schulz Paris ESRO Apr. 1973 96 p

(Contract ESTEC-1370/71)

(ESRO-CR-96) Avail: NTIS HC $7.00

Environmental tests, viz. temperature cycling, thermal shock, sinusoidal vibration, random vibration, shock and temperature distribution, were performed on a flywheel built to prove the applicability of the latest design for the project Symphonie. This model differs from the Symphonie qualification model in the following respects: (1) no lubricant storage; (2) different lubricant; and (3) the mock-up used for the electronics unit incorporated only those components required for operation with an external motor electronics, such as light barrier segment and stator. Before and after each test, the functional operations were checked, the wheel opened and the unbalance and perpendicularity of the angular momentum vector measured. Author (ESRO)

N73-30470# Laboratoire Central de Recherches Thomson-CSF, Orsay (France).

HOLOGRAPHIC RECORDING OF HF SIGNALS FOR SILICON SOLAR CELL ARRAYS Final Report

C. Puech Paris ESRO 29 Mar. 1972 114 p refs

(Contract DRME-70/141)

(LCR-DR-1-72-52/1/R) Avail: NTIS HC $7.75

The development of a module technique for welded interconnections, was achieved. Optimal materials and coating techniques were found for interconnectors. The welding parameters chosen were such that adequate mechanical strength was achieved without electrical degradation of the cells, even after environmental testing. Interconnectors that gave good performance within modules were designed, and the modules were then subjected to environmental testing. Recommendations were made concerning repair, quality assurance, and fabrication. Since welding is an interconnection method that gives highly reproducible results when automated, it is applicable to a wide temperature range and is flexible as regards module size. Author (ESRO)

N73-30471# Defense Documentation Center, Alexandria, Va.
ADHESION BONDING Report Bibliography, Jan. 1970 - Jan. 1973
Jul. 1973 96 p refs
(AD-763200; DDC-TAS-73-35) Avail: NTIS CSCL 13/8

The bibliography is comprised of citations of unclassified reports dealing with adhesion bonding. These references pertain to bonding of metals, stainless steel, composite materials, and crystals. The techniques and effectiveness of manufacturing methods, process development and quality control of sealing compounds and adhesives for bonding are discussed. Corporate Author-Monitoring Agency, Subject, Title, Personal Author, Contract, and Report Number Indexes are included.

Author (GRA)

N73-30472# Defense Documentation Center, Alexandria, Va.
ETCHING Report Bibliography, Jan. 1959 - Aug. 1972
Jul. 1973 191 p refs
(AD-763100; DDC-TAS-73-28) Avail: NTIS CSCL 13/8

The bibliography is a compilation of unclassified reports on Etching. The collection of references primarily deal with the capabilities and limitation of Etching techniques, materials for which they are suitable, and the different etchants and solutions used in the process. Corporate Author-Monitoring Agency, Subject, Title, and Personal Author Indexes are included.

Author (GRA)

N73-30473# Panametrics, Inc., Waltham, Mass.
MEASUREMENT OF ELASTIC MODULI OF MATERIALS AT ELEVATED TEMPERATURE Quarterly Progress Report
Kenneth A. Fowler, Lawrence C. Lynnworth, Edmund D. Carnevale, and James Chen 14 May 1973 38 p refs
(Contract N00014-73-C-0023; NR Proj. 384-320)
(AD-763763; QPR-3) Avail: NTIS CSCL 14/2

The report contains new data on modulus and attenuation at elevated temperatures. It also contains theoretical calculations pertaining thereto. Work for the quarter is reviewed.

Author (GRA)

N73-30474# Naval Air Engineering Center, Philadelphia, Pa. Ground Support Equipment Dept.
VACUUM PUMP EXPLOSION STUDY Progress Report
Thomas Dale Weikel and H. H. Yueh Aug. 1972 28 p refs
(AD-763370; NAEC-GSED-60) Avail: NTIS CSCL 13/11

An investigation was made into explosions and backfires occurring in vacuum pumps used on Navy oxygen component test stands. Research and testing uncovered several fire and toxicity hazards on these pumps which carry gaseous oxygen flows. Corrective recommendations are included. Author (GRA)

N73-30475# Illinois Univ., Urbana. Dept. of Civil Engineering.
THE EFFECT OF INTERNAL WELD DEFECTS ON THE FATIGUE BEHAVIOR OF WELDED CONNECTIONS Final Report
David H. Ekstrom and W. H. Munse Feb. 1973 98 p refs
Sponsored by DOT and Illinois State DOT
(PB-220896/5; UILU-ENG-73-2002; SRS-395; ICHRP-137)
Avail: NTIS HC $4.85 CSCL 13E

A study was made of the effect of internal flaws on the fatigue behavior of butt-welded connections in mild structural steel, the initiation of fatigue cracks from these flaws, and the propagation rates of these cracks in the connections. Since internal flaws occur in many welds it is essential to obtain a better understanding of the behavior of flawed connections so that adequate, yet realistic, code requirements can be established. The study is limited to two major types of defects, porosity and incomplete penetration. (Modified author abstract) GRA

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid-State.

N73-30476* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HOLOGRAPHIC THIN FILM ANALYZER Patent
John R. Williams and Burnice N. Norden, inventors (to NASA)
Issued 10 Jul. 1973 5 p Filed 30 Aug. 1971 Supersedes N72-10431 (10 -01, p 0063)
(NASA-Case-MFS-20823-1; US-Patent-3,744,912;
US-Patent-Appl-SN-175981; US-Patent-Class-356-108;
US-Patent-Class-356-109; US-Patent-Class-350-3.5) Avail: US Patent Office CSCL 20E

A system for the analysis and measurement of thin films in which the light output of a laser is split into two beams is discribed. The first beam is focused to illuminate the entire area of a photographic plate and the second beam is columnated and directed through a relatively small portion of the photographic plate onto the sample with the film to be observed. The surface of the sample is positioned at a slight angle with respect to a plane normal to the second beam and the light reflected from the sample arrives back at the photographic plate in a region other than through which the second beam originally passes. By making two successive exposures during the deposition of material on the surface of the sample, holograms are recorded on the photographic plate. The plate is then developed and interference lines of the hologram provide a measurement of the film or material deposited between exposure.

Official Gazette of the U. S. Patent Office

N73-30477 Cornell Univ., Ithaca, N.Y.
LASER MOTIVATED STUDIES OF CHEMILUMINESCENCE IN METAL OXIDES AND NITRIDES Ph.D. Thesis
Robert Sven Anderson 1972 131 p
Avail: Univ. Microfilms Order No. 73-5844

Many important requirements for building a chemical laser are examined and applied to special ease of a visible chemical system. Criteria such as the pumping rates, the distribution of population of the excited electronic state, and the problems of population build up of the lower state are considered. The properties of the molecules BN, BO and CN are examined with these special laser criteria in mind. The important class of reactions in which electronically excited molecules are created in a transfer reaction was examined. Potential crossing of the excited electronic state with the ground state are necessary for such reactions and furthermore this type of reaction appears to be the only way of obtaining electronically excited molecules in a chemical reaction without utilizing an intermediate state. The newly discovered electronic state in BN exhibits such a crossing, making it an excellent candidate for a laser medium.

Dissert. Abstr.

N73-30478*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HOLOGRAPHIC SYSTEM FOR NONDESTRUCTIVE TESTING Patent Application
Robert L. Kurtz, inventor (to NASA) Filed 8 Aug. 1973 14 p
(NASA-Case-MFS-21704-1; US-Patent-Appl-SN-386793) Avail: NTIS HC $3.00 CSCL 20E

A holographic system for nondestructive testing of objects and producing detailed holograms of the test object despite its movement is described. The system consists of a positionable mirror that provides illumination of the object at various angles. Holograms are produced with varying degrees of sensitivity by changing the illumination angle on the test object. Such a procedure allows optimum observation of dimensions of deformation of an object occuring between test exposures. NASA

N73-30479# Technische Hochschule, Vienna (Austria). Inst. fuer Hochfrequenztechnik.
DATA TRANSMISSION WITH THE HELP OF LASERS [DATENUEBERTRAGUNG MIT HILFE VON LASERN]
31 Dec. 1972 83 p refs In GERMAN
Avail: NTIS HC $6.25

The application of carbon dioxide lasers for data transmission is proposed. Limitations to the system from the aspect of the absorption spectrum are described. Mathematical models are developed to show the relationship of the various laser parameters. The test equipment and the experimental procedures for evaluating the transmitting capability of the lasers are reported. The characteristics of two carbon dioxide lasers are tabulated.

Transl. by P.N.F.

N73-30480# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Reaktionskinetik.

REACTION-KINETICS CALCULATIONS OF A CO2-N2-He GASDYNAMIC LASER

Paul Roth 27 Mar. 1972 43 p refs In GERMAN; ENGLISH summary

(DLR-FB-72-21) Avail: NTIS HC $4.25; DFVLR, Porz, West Ger. 13,70 DM

The calculation of the power output of CO2-N2-He lasers depends on the common kinetic' model as well as the transition probabilities of the elementary energy transfer processes. Using experimental data, the production of population inversion by a nozzle expansion and the profile of the outcoming intensity of the cavity are computed. For the Laval nozzle configuration and a stagnation temperature of 1500K a power of from 6 to 12W per flow area was obtained as a function of stagnation pressure. The laser action is assumed to take place in one vibrational-rotational line. ESRO

N73-30481# Columbia Univ., New York.

VIBRATION-ROTATION RELAXATION USING MODE LOCKED AND Q-SWITCH GAS LASERS Final Technical Report, 1 Mar. 1970 - 27 Feb. 1973

George W. Flynn 1 May 1973 16 p refs

(Grants DA-ARO(D)-31-124-72-G107; DA-ARO(D)-31-124-71-G66; DA-ARO(D)-31-124-70-G45)

(AD-763292; TR-1; AROD-8394-11-P) Avail: NTIS CSCL 07/4

Laser fluorescence and double resonance studies have been made in polyatomic molecules. These experiments monitor the flow of energy between the various degrees of freedom in systems such as CH3F, C2H4, and SF6 as well as mixtures of these molecules with rare gases. In general the rate of equilibration of the vibrational modes among themselves is typically 100-1000 times faster than the rate of equilibration of the vibrational degrees of freedom with the translational and rotational degrees of freedom. For CH3F where the most data is available, a partial vibrational energy transfer map has been developed which provides insight into the paths by which the vibrational modes of this molecule come into equilibrium with each other. Such maps are extremely useful in predicting possible new laser transitions and in the development of laser infrared photochemistry. (Modified author abstract) GRA

N73-30482# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

MECHANICAL EFFECTS ACCOMPANYING THE INTERACTION OF LASER RADIATION WITH A SUBSTANCE (SECTION 8)

Ya. B. Zeldovich and Yu. P. Raizer 18 Jun. 1973 14 p Transl. into ENGLISH from the monograph "Mekhanika v SSSR za 50 Let" Moscow, v. 2, 1970 p 263-268

(AD-763258; FTD-HT-23-322-73) Avail: NTIS CSCL 20/5

A new area for experimental and theoretical studies has opened in recent years in which physical and mechanical (more often hydrodynamic) phenomena are tightly interwoven and which can, with full justification, be applied to the material of this review. The report refers to the physical and, more specifically, the mechanical effects occurring as a result of the interaction between powerful laser beams and various substances: gases, opaque solids, and transparent solid and liquid media. The authors discuss briefly the results of studies conducted by Soviet authors in this field. GRA

N73-30483# Purdue Univ., Lafayette, Ind. Thermal Sciences and Propulsion Center.

GAS DYNAMICS OF CAVITIES-IN-SERIES GDL GAS DYNAMICS LASER: SURVEY AND EXTENSION

S. N. B. Murthy Jan. 1973 136 p refs

(Contract DAAH01-72-C-0864)

(AD-763255; TSPC-73-1) Avail: NTIS CSCL 20/5

In the development of large gas dynamic lasers (GDL) which are required to be mobile and possibly air-borne the problem of assuring a positive start of the system without exhaust pumps becomes of great importance, especially when laser power extraction is sought to be increased by the use of cavities-in-series. A morphological analysis of such systems as well as a method of determining the transient states during a starting process is presented here with a brief account of the current status of the gas dynamic lasers. It is concluded that there are no problems which may basically prevent the adoption of cavities-in-series configurations in GDL; however, each system has to be optimized with respect to the expansion and cavity dynamics as well as the cavity optics. Author (GRA)

N73-30484# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

EFFECT OF THE CONNECTING APERTURE IN A RESONATOR MIRROR ON THE RADIATION POWER OF A CO2 LASER

V. T. Prokopenko and M. P. Bogdanov 29 Jun. 1973 15 p refs Transl. into ENGLISH from Tr. Vopr. Kvantovov Elektron. (Leningrad), v. 67, 1970 p 98-104

(AD-763254; FTD-HT-23-575-73) Avail: NTIS CSCL 20/5

The experiments were performed on a laser based on a system with an internal resonator, where the length of the resonator remained invariable and where at a certain radius of curvature in the mirror the diameter of the connecting aperture could be from 5 to 25 mm, which was from 1.1% to 27% of the total aperture of the mirror. GRA

N73-30485# Army Missile Command, Redstone Arsenal, Ala.

CW CHEMICAL LASER MODELING INCLUDING SIMPLE TEMPERATURE AND MIXING EFFECTS

T. G. Roberts and W. A. Friday 25 Apr. 1973 39 p refs

(DA Proj. 1T5-62609-A-308)

(AD-763169; RR-73-2) Avail: NTIS CSCL 20/5

The simple numerical model of a flowing continuous wave (cw) chemical laser Cl - HBr yields HCl + Br reaction has been used to study certain effects on the output power. The effects being studied occur when the rotational temperature is allowed to be different from the translational temperature, when these temperatures are equal but the rotational distributions are allowed to deviate from Boltzmann, and when the mixing rate is allowed to vary. Simple schemes are included in the model to obtain an idea of the effects and trends which can be expected as a function of these variations. The numerical results are presented. Author (GRA)

N73-30486# Dayton Univ. Research Inst., Ohio.

RESEARCH AND DEVELOPMENT ON LASER, SEMICONDUCTING AND MAGNETIC MATERIALS Final Report, 1 Nov. 1970 - 1 Dec. 1972

Perry P. Yaney, John A. Detrio, J. Michael Ohare, Clark W. Searle, and Rex L. Jones Jan. 1973 89 p refs

(Contract F33615-71-C-01121; AF Proj. 7371)

(AD-763709; UDRI-TR-73-01; AFML-TR-73-52) Avail: NTIS CSCL 20/5

A final report on the work accomplished during a two-year program on laser, semiconducting, and magnetic materials is presented. The laser materials studied included YAl 03:Er(3-), SrF2:(Gd(3-), and Ce(3-), CdF2: (Gd(3-), Ce(3-)). High-resolution optical spectroscopy and EPR studies were carried out. Electrical characteristics of the insulating and semiconducting states of the doped CdF2 system were studied and LED's were constructed using this system. Extensive theoretical and computational studies were carried out on the YAl03 and SrF2 doped materials. An experimental facility for the evaluation of laser materials at the sponsor's site was begun. The pulsed Raman technique was developed. Electrical and optical properties of ZnSe doped with Li, Cu, or Na as well as samples implanted with Zn and samples of ZnO hydrothermally grown with Li, CdS, or ZnS were studied. Also, measurements were made on radiation damaged Ge and Si. The intrinsic coercive force in multidomain single crystal (rare earth) Co5 alloys were studied and a model describing the observed behavior is presented. Author (GRA)

N73-30487# Mathematical Sciences Northwest, Inc., Seattle, Wash.

ELECTRON BEAM MOLECULAR LASERS Semiannual Technical Report, 15 Mar. - 15 Nov. 1972

S. R. Byron Nov. 1972 102 p refs

(Contract N00014-72-C-0430; ARPA Order 1807)

(AD-763409; MSNW-72-105-1) Avail: NTIS CSCL 20/5

An experimental and theoretical study has been initiated on

the application of electron-beam-stabilized electrical discharges to the excitation of infrared laser emission from HF and DF molecules. Electric discharge pumping of H2 or D2 vibration is used together with near-resonant V-V transfer to HF or DF. Initial experimental observations of HF fluorescence and absorption in argon, hydrogen, hydrogen fluoride mixtures at 0.25 atm and room temperature confirm the basic principles involved. An additional task was carried out under this contract to evaluate the possibility of generating long duration, high energy density laser pulses on various molecules, particularly CO2. Measurements were made of optical disturbances induced by the electrical discharge, electron beam requirements and arc formation at high pressure, and optical gain at high pressure. (Modified author abstract) GRA

N73-30488# Ford Motor Co., Dearborn, Mich. Scientific Research Staff.

WAVEGUIDE AND LUMINESCENT PROPERTIES OF THIN-FILM Pb-SALT INJECTION LASERS Quarterly Report, 1 Mar. - 30 Jun. 1973

W. H. Weber, S. L. McCarthy, M. Mikkor, and K. F. Yeung 31 Jul. 1973 49 p refs

(Contract N00014-73-C-0289; ARPA Order 2327)

(AD-763757; QR-1) Avail: NTIS CSCL 20/5

The authors describe the waveguide properties of the asymmetric dielectric slab formed by a very high index film on a low index substrate. The analysis is appropriate for Pb-salt films grown on fluorite structure substrates. The mode reflectivities, surface scattering losses, and gain enhancements for the low order TE and TM modes are considered. The stronger confinement of the TM modes leads to larger gain enhancements and larger scattering losses than for the TE modes of the same order. For the film thicknesses of interest, 2-4 micrometers, the TE and TM mode reflectivities are comparable. Experimental results are presented for thin-film diode lasers made with Pb Schottky barriers on p-type PbTe (index 6.4) grown epitaxially on BaF2 substrates (index 1.42). Laser emission at 6.5 micrometers, both pulsed and cw, is observed at 10-15K. The optical gain is estimated from the measured current and quantum efficiency, while the free carrier and reflection losses are calculated from the device parameters. The remaining losses, attributed to surface scattering, can then be estimated from the threshold condition. (Modified author abstract) GRA

N73-30489# Mathematical Sciences Northwest, Inc., Seattle, Wash.

HF LASER BY DIRECT ELECTRICAL DISCHARGE EXCITATION

S. R. Byron, L. Y. Nelson, and G. J. Mullaney Nov. 1972 10 p ref

(Contract N00014-72-C-0430)

(AD-763464) Avail: NTIS CSCL 20/5

Using a high current, long pulse, electron-beam stabilized electrical discharge, laser oscillation has been observed from 2.8 to 3.1 microns on vibration-rotation bands of HF in mixtures of argon with HF, argon plus hydrogen with HF, argon plus deuterium with HF, argon plus nitrogen with HF, and pure nitrogen with HF. Author (GRA)

N73-30490# Battelle-Northwest, Richland, Wash.

INVESTIGATE MATERIAL SYSTEMS FOR MIRRORS USED IN HIGH POWER CO AND CO2 LASERS Semiannual Technical Report

Dec. 1972 79 p

(Contract N00123-72-C-2215)

(AD-763795) Avail: NTIS CSCL 20/5

Results are presented from the first phase of a three-phase program sponsored by Advanced Research Projects Agency to develop a laser mirror material system. Copper, dispersion hardened with the addition of 0-5 vol% SiC or Al2O3, was deposited by high-rate sputtering to produce a stable, fine-grain (-0.4 micrometer) polishable material exhibiting a surface roughness of less than 15 A rms when it was mechanically polished. Instruments for measuring surface roughness by scattered light and mirror absorption by differential calorimetry were also designed, constructed, and successfully employed in measuring surface properties and mirror optical absorption. Author (GRA)

N73-30491# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.

A REVIEW OF RATE COEFFICIENTS FOR REACTIONS IN THE H2-F2 LASER SYSTEM

Norman Cohen 1 Nov. 1972 79 p refs

(Contract F04701-72-C-0073)

(AD-763715; TR-0073(3430)-9; SAMSO-TR-73-209) Avail: NTIS CSCL 07/4

The chemical and energy transfer reactions involved in the hydrogen fluoride chemical laser system are discussed. Current experimental and theoretical evidence relevant to a selection of the most probable values of rate coefficients is reviewed, and a set of best values is recommended. Author (GRA)

N73-30492# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.

EFFECT OF H2 PRESSURE ON PULSED H2 PLUS F2 LASER, EXPERIMENT AND THEORY Report for Sep. 1971 - Feb. 1972

Steven N. Suchard, Ronald L. Kerber, George Emanuel, and James S. Whittier 30 Mar. 1973 50 p refs

(Contract F04701-72-C-0073)

(AD-763716; TR-0073(3540)-1; SAMSO-TR-73-207) Avail: NTIS CSCL 20/5

Stimulated emission predictions and measurements for an H2 - F2 laser are compared for H2 pressures from threshold to stoichiometric, a range of several orders of magnitude. Slowly flowing, helium-diluted, 50-Torr mixtures are initiated photolytically. Two dilution ratios and two output couplers are considered, and good agreement is found for time to threshold and pulse duration vs H2 pressure. Spiking, relaxation oscillations, and possibly mode beating freatures not modeled, are observable in some pulses; however, predicted intensity vs time generally agrees in pulse shape with laser output. Observed and predicted peak intensities nearly match for low H2 pressure, and the predicted increase of peak intensity with low H2 is followed fairly well. (Modified author abstract) GRA

N73-30493# Hughes Aircraft Co., Culver City, Calif. Laser Technology.

LASER EXHAUST MEASUREMENT PROGRAM Final Report

Gary J. Linford Sep. 1972 71 p refs

(Contract EPA-68-02-0203)

(PB-220429/5; EPA-R2-72-136) Avail: NTIS HC $4.50 CSCL 20E

The report serves as an introduction to the theory of the Laser Exhaust Measurement (LEM) program, a detailed description of the operating characteristics of the equipment, and as a general operating manual for the entire LEM system. The LEM apparatus is composed of a number of subsystems and individual components constructed by a variety of manufacturers. The original operating manuals are included in the appendices. The eight chapters of the report present the following information: a brief description of the construction and operation of each LEM subsection and/or component; a detailed description of each of the major components; a detailed stepby-step LEM operation manual; details of xenon laser operation and adjustment; and a description of the necessary steps involved in the initial LEM assembly. Author (GRA)

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N73-30494 British Library Lending Div., Boston Spa (England).

FLOW CURVES AND THEIR CONSIDERATION FROM A METALLURGICAL POINT OF VIEW

R. Siegel and G. Fritzsch Sep. 1972 18 p refs Transl. into ENGLISH from Technik (East Berlin), v. 24, no. 7, 1969 p 468-472

(BLL-RAE-Lib-Trans-1675) Avail: British Library Lending Div., Boston Spa, Engl.

Various equations used to describe flow curves for metals are discussed and some of their limitations are explained. Consideration is given to some of the structure and temperature dependent variables which influence flow curves. The structure dependent variables are: (1) composition, (2) grain size, (3) degree of prestrain, (4) texture, and (5) the Bauschinger effect. The temperature dependent variables are: (1) aging, (2) stretch aging, (3) recrystallization, (4) phase transformations, and (5) forming in the metastable austenite bay. It is concluded that in the case of cold working, composition, grain size, and degree of prestrain are the most important variables. In the case of hot working, the recrystallization temperature and any phase transformations occurring are the most important factors. Author

N73-30495 National Lending Library for Science and Technology, Boston Spa (England).

APPROXIMATE METHODS OF CALCULATING THE DIRECT PROBLEM IN OPTIMIZING THE HEATING OF METAL. REPORT 2

V. Yu. Kaganov and V. M. Orkin 1973 13 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), v. 1, 1973 p 163-168

(NLL-M-21666-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

An efficient technique is proposed for use with the cleaving method to deal with complex boundary conditions in the solution of multidimensional linear thermal conductivity problems. The advantages of using the proposed method as opposed to the explicit system are illustrated along with the feasibility of performing the calculations on an analog computer. The solutions for three example cases are given. Author

N73-30496 National Lending Library for Science and Technology, Boston Spa (England).

SPECIAL FEATURES OF THE SIMPLE STRUCTURAL-EUTECTIC TRANSFORMATIONS IN THE LIQUID PHASE OF METAL-SEMICONDUCTOR AND METAL-METAL SYSTEMS

E. S. Filippov 1973 14 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Chern. Met. (USSR), v. 1, 1973 p 129-133 In ENGLISH and RUSSIAN

(NLL-M-21665-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

Features of the structural-eutectic transformations in the liquid phase of metal-semiconductor and metal-metal systems are discussed. Structural diagrams for the liquid phase in aluminum-germanium and nickel-chromium systems are plotted from results of measuring the density and geometrical parameters of molten droplets and light radiation intensities. The effects of temperature on structural ordering cupola shifts and structural transitions in the liquid phase are described. The division of structural transformations in molten alloys into simple and complex categories is reported. Author

N73-30497 National Lending Library for Science and Technology, Boston Spa (England).

METHOD OF DISCRETIZATION IN PROBLEMS OF THE TREATMENT OF METALS BY PRESSURE, PART 1

B. E. Khaikin, I. Ya. Tarnovskii, V. I. Odinokov, and V. G. Glazunov [1973] 14 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), v. 1, 1973 p 103-107

(NLL-M-21663-(5828.4F)) Avail: Natl. Lending Library , Boston Spa, Engl.: 2 NLL photocopy coupons

An analysis is given of known discrete methods of solving variational problems and a new method of solution is proposed for the rates of variational problems in the treatment of metals by pressure. The essential features of the method are as follows: (1) the deformation zone is divided into individual compartments; (2) the components of the tensor of rates of shear strain in the nodes of each compartment are written in the form of different relationships, expressed by the required rates in the nodes of each compartment; and (3) the functional of the problem is written in the form of the sum of the functionals, supplied by the individual compartments. Author

N73-30498 National Lending Library for Science and Technology, Boston Spa (England).

DUCTILE-PLASTIC FLOW KINEMATICS OF THE METAL DURING THE EXTRUSION OF CABLE SHEATHING

P. I. Polukhin, B. V. Maryanchik, and G. Ya. Gun [1973] 18 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Chern. Met. (USSR), v. 1, 1973 p 82-87 In ENGLISH and RUSSIAN

(NLL-M-21661-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

An analysis of the ductile-plastic kinematics of metal during the extrusion of cable sheathing was conducted. The features of the upper limit method, as used for assessment of complex flow zones, are examined. The effect of the out-of-contact deformations as a function of the zone geometry is also investigated experimentally using a computer. A block diagram and the description of the algorithm for solution of the problem are given. Author

N73-30499 National Lending Library for Science and Technology, Boston Spa (England).

MICROSTRUCTURAL INVESTIGATION OF St.345 STEEL BIMETAL PRODUCED BY PRESSURE WORKING

N. A. Chelyshev, G. M. Tov, L. K. Kaimasov, and L. I. Fadeeva [1973] 9 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., (USSR), v. 2, 1973 p 86-89

(NLL-M-21699-(5828.4F)) Avail: Natl. Lending Library, Boston, Spa, Engl.: 1 NLL photocopy coupon

The results are described of an investigation of the bonding zone and near-boundary site structures of the bimetal. The bimetal, with nickel interlayer, was produced by pressure working with various holding times and without the use of vacuum. The method was found to give good bonding strength between the metals. Author

N73-30500# Aeronautical Research Labs., Melbourne (Australia).

BIBLIOGRAPHY ON STRESS WAVE EMISSION, 1950 - 1972

G. G. Martin Feb. 1973 41 p refs

(ARL/Met-Bibl-1) Avail: NTIS HC $4.25

Known sources of information relating to stress wave emission have been collected and are listed under two headings-articles readily available in Australia and articles available elsewhere. Author

N73-30501# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON METALLURGY

27 Jul. 1973 14 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Metally (Moscow), no. 3, 1973 p 39-42, 140-142

(JPRS-59637) Avail: NTIS HC $3.00

The mechanism of removing nitride inclusions from heat-resistant alloys during melting and the behavior of hafnium dioxide particles in precipitation-hardened nickel during isothermal annealing are presented. For individual titles, see N73-30502 through N73-30503.

N73-30502 Joint Publications Research Service, Arlington, Va.

MECHANISM OF REMOVING NITRIDE INCLUSIONS FROM HEAT-RESISTANT ALLOYS DURING MELTING

A. V. Leytes, N. A. Mironova, and N. Ye. Kissil *In its* Transl. on Met. (JPRS-59637) 27 Jul. 1973 p 1-7 refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Metally (Moscow), no. 3, 1973 p 39-42 (For availability see N73-30501 21-17)

Processes of metal refining during vacuum-arc melting lead to lowering of the content of nonmetallic inclusions and gases in the ingot. Existing concepts on the mechanism of removing inclusions from metal during vacuum-arc remelting (VAR) are basically reduced to processes of floating and dissociation. However, as thermodynamic analysis shows, the high temperature of the metal in the region of burning arc eliminates the possible existence of most of the inclusion of (including nitrides) in the molten bath. At the same time, observations into VAR show that an accumulation of slag occurs on the bath surface, rendering a large effect on stability of the electrical mode of remelting and ingot quality. Refining of metal during VAR is a complex

process, and its effectiveness under ideal conditions depends on many factors. Author

N73-30503 Joint Publications Research Service, Arlington, Va.
BEHAVIOR OF HAFNIUM DIOXIDE PARTICLES IN PRECIPITATION-HARDENED NICKEL DURING ISOTHERMAL ANNEALING
Ye. N. Timofeyeva and N. Ye. Beresten *In its* Transl. on Met. (JPRS-59637) 27 Jul. 1973 p 8-12 refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Metally (Moscow), no. 3, 1973 p 140-142 (For availability see N73-30501 21-17)

Precipitation-hardened alloys of the type TD-nickel are strengthened by finely dispersed refractory oxides added to the material. The oxides, being preserved almost without change up to temperatures at which conventional intermetallic strengtheners and carbides are fully dissolved, stabilize the microheterogeneous structure providing the most increase in heat resistance. The nature of strengthener particle size and distribution is an important condition for achieving high structural stability and properties. The effect of initial dimensions of the particles of the strengtheners, hafnium dioxide, on structural changes and properties of Ni + 3.4% (by volume) HfO2 in isothermal annealing is presented. Author

N73-30504# Bureau of Mines, Albany, Oreg. Metallurgy Research Center.
EFFECT OF COPPER AND SILICON ON SELECTED MECHANICAL PROPERTIES OF HOT-ROLLED MEDIUM-CARBON STEELS
Mark I. Copeland 1973 22 p refs
(BM-RI-7777) Avail: NTIS HC $3.25 CSCL 11F

The effect is investigated of up to 1 wt-pct of copper and silicon on the heat treatment response and hardness, tensile, and impact properties of hot-rolled medium-carbon steels. The steels were prepared by induction melting and fabricated into plates by forging and rolling. The tensile strength of 0.2-wt-pct carbon steels containing 0.3 wt-pct silicon was affected significantly by copper in both the hot-rolled and heat-treated (600 C) conditions, whereas the tensile strength of the 0.3-wt-pct carbon steels was less affected. A 600 C treatment was considered optimum as a post-rolling treatment to strengthen the steels by copper precipitation. Strengthening of 0.2-wt-pct carbon steels by silicon was reduced by increasing copper contents. Optimum impact strengths occurred at about 0.3 wt-pct silicon in 0.2-wt-pct carbon steels containing 0.6 and 0.8 wt-pct copper. The impact strengths were lowest for 0.2-wt-pct carbon steels containing over 0.8 wt-pct copper and greater than 0.3 wt-pct silicon, especially in the heat-treated condition. Copper and silicon solutes and copper precipitates strengthened the steels. This effect was augmented slightly by strengthening through grain refinement by these solutes. Author

N73-30505# Bureau of Mines, Albany, Oreg. Metallurgy Research Center.
THE K2HfF6-K2ZrF6-1.25 PERCENT HF SYSTEM AT 40 C WITH OTHER SOLUBILITY CURVES FROM 25 TO 70 C
Stanley C. Rhoads 1973 23 p refs
(BM-RI-7785) Avail: NTIS HC $3.25

The complete ternary system K2HfF6K2ZrF6-1.25 weight-percent HF at 40 C was investigated. In addition, solubility curves were established at 25, 30, 50, 60, and 70 C. These solubility data implemented a study of hafnium enrichment in feed solutions for liquid-liquid extraction processes. Selected K2HfF6-K2ZrF6-1.25 weight-percent HF mixtures were equilibrated in a constant temperature bath. Compositions of the equilibrated solutions and wet residues were established from combined hafnium and zirconium oxide and total fluorine analyses. All solubility curves were essentially parallel on triangular coordinates. At 40 C, the solid phase of the K2HfF6-K2ZrF6-1.25 percent HF system is a series of solid solution hydrates with K2HfF6.H2O and K2ZrF6.3H2O segments existing at the respective extremes. Since this system contains K2HfF6.H2O and K2ZrF6.3H2O segments, it is not ideal for simple separation of high-purity K2HfF6 from K2HfF6-K2ZrF6 mixtures by recrystallization. However, it would be useful for producing hafnium-enriched feed solutions from zircon concentrates for liquid-liquid extraction of hafnium from zirconium. Author

N73-30506*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
ENRICHED ALUMINIDE COATINGS FOR DISPERSION STRENGTHENED NICKEL MATERIALS
Moses A. Levinstein Aug. 1973 206 p refs
(Contract NAS3-14314)
(NASA-CR-121250) Avail: NTIS HC $12.50 CSCL 11F

Improved aluminide/barrier coating combinations for dispersion strengthened nickel materials were investigated. The barrier materials involved alloys with refractory metal content to limit interdiffusion between the coating and the substrate, thereby minimizing void formation. Improved aluminide coatings involved the dispersion of aluminum-rich compounds. Coatings were tested in argon at 1533 K (2300 F) for 100 hours and in cyclic oxidation at 1422 K (2100 F). Two coatings on TDNiCr completed 300 hours of oxidation testing, none on TDNi. Selected coating combinations were evaluated in Mach 1 burner rig testing using JP-4 fuel and air at 1422 K (2100 F) and 1477 K (2200 F) for 350 and 100 hours, respectively. Static oxidation in 1-hour cycles was conducted at 1533 K (2300 F) for 100 hours. For comparison purposes a physical vapor deposition (PVD) NiCrAlY coating was tested concurrently. Only the NiCrA1Y coating survived the 1477 K (2200 F)/100-hour burner rig test and 275 hours of the 350-hour 1422 K (2100 F) test. Elevated temperature exposure reduced room temperature tensile properties but had little effect on elevated temperature properties. Author

N73-30507*# IIT Research Inst., Chicago, Ill. Metals Research Div.
ADDITIONAL THERMAL FATIGUE DATA ON NICKEL- AND COBALT-BASE SUPERALLOYS, PART 1 Final Report
Maurice A. H. Howes 15 Mar. 1973 100 p refs
(Contract NAS3-14311)
(NASA-CR-121211; IITRI-B6107-34-Pt-1) Avail: NTIS HC $7.00 CSCL 11F

The fluidized bed technique was used to measure the relative thermal fatigue resistance of twenty-one superalloys. Among the thirty-six variations of composition, solidification method, and surface protection the cycles to cracking differed by two to three orders of magnitude. Some alloys sufferd serious weight losses and oxidation. Thermal fatigue data, oxidation, and dimensional changes are reported. The types of superalloys are identified. P.N.F.

N73-30508*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MATERIALS TECHNOLOGY PROGRAMS IN SUPPORT OF A MERCURY RANKINE SPACE POWER SYSTEM
Phillip L. Stone Washington Sep. 1973 48 p refs
(NASA-TN-D-7355; E-7382) Avail: NTIS HC $3.00 CSCL 11F

A large portion of the materials technology is summarized that was generated in support of the development of a mercury-rankine space power system (SNAP-8). The primary areas of investigation are: (1) the compatibility of various construction materials with the liquid metals mercury and NaK, (2) the mechanical properties of unalloyed tantalum, and (3) the development of refractory metal/austenitic stainless steel tubing and transition joints. The primary results, conclusions, and state of technology at the completion of this effort for each of these areas are summarized. Results of possible significance to other applications are highlighted. Author

N73-30509*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OBSERVATION OF OXIDE PARTICLES BELOW THE APPARENT OXYGEN SOLUBILITY LIMIT IN TANTALUM
Stephan Stecura Washington Sep. 1973 17 p refs
(NASA-TM-X-2889; E-7530) Avail: NTIS HC $2.75 CSCL 11F

The apparent solubility of oxygen in polycrystalline tantalum as determined by the X-ray diffraction lattice parameter technique is about 1.63 atomic percent at 820 C. However, oxide particles were identified in samples containing as low as 0.5 atomic percent of oxygen. These oxide particles were present at the grain boundaries and within the grains. The number of oxide particles increased with increasing oxygen concentration in tantalum. The presence of oxide particles suggests that the true solubility of

oxygen in the polycrystalline tantalum metal is probably significantly lower than that reported in the literature. Author

N73-30510*# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
SEGREGATION EFFECTS DURING SOLIDIFICATION IN WEIGHTLESS MELTS Final Report, 1 Jan. 1972 - 29 Jun. 1973
Chou Li Jun. 1973 350 p refs
(Contract NAS8-27891)
(NASA-CR-124358; RE-458) Avail: NTIS HC $19.50 CSCL 11D

Two types of melt segregation effects were studied: (1) evaporative segregation, or segregation due to surface evaporation; and (2) freezing segregation, or segregation due to liquid-solid phase transformation. These segregation effects are closely related. In fact, evaporative segregation always precedes freezing segregation to some degree and must often be studied prior to performing meaningful solidification experiments. This is particularly true since evaporation may cause the melt composition, at least at the critical surface regions or layers to be affected manyfold within seconds so that the surface region or layer melting point and other thermophysical properties, nucleation characteristics, base for undercooling, and critical velocity to avoid constitutional supercooling, may be completely unexpected. An important objective was, therefore, to develop the necessary normal evaporation equations for predicting the compositional changes within specified times at temperature and to correlate these equations with actual experimental data collected from the literature. Author

N73-30511# California Univ., Berkeley. Lawrence Berkeley Lab.
FACTORS CONTROLLING THE FRACTURE TOUGHNESS OF CRYOGENIC ALLOYS M.S. Thesis
Wade Alan Horwood Dec. 1972 8 p refs
(Contract W-7405-eng-48)
(LBL-1121) Avail: NTIS

The factors controlling the fracture toughness of cryogenic alloys are discussed. The design of an iron base alloy with superior combinations of strength and toughness at minus 196 C was attempted. The desired properties of the alloy at temperatures of 23 and minus 196 C are listed. The heat treatment procedures for obtaining the desired properties are explained. It is stated that the high toughness of the alloy is due to: (1) a high nickel content, (2) an initially low interstitial content, (3) interstitial scavenging by titanium, and (4) a fine grain size with finely dispersed, dislocation substructure. Author (NSA)

N73-30512# California Univ., Berkeley. Lawrence Berkeley Lab.
HIGH TEMPERATURE CREEP IN METALS AT INTERMEDIATE AND LOW STRESSES Ph.D. Thesis
Farghali Abdel Rahman Mohamed Nov. 1972 128 p refs
(Contract W-7405-eng-48)
(LBL-1183) Avail: NTIS

High temperature creep was studied in aluminum-3% magnesium (solid solution alloy), aluminum, lead, and tin in the stress range of 10 to the minus 6th power to 10 to the minus 3rd power al alloys, lead and tin G using double shear type specimens at temperatures near the melting point. The experimental data reveal two important transitions in the rate controlling mechanism: (1) In aluminum-3% magnesium there is a transition from viscous glide behavior to climb controlled mechanism at iota is approximately 6 x .00005. The identification of such a transition was determined from the stress exponent, n, the type of the creep curve observed and the activation energy for creep. (2) For aluminum-3% magnesium, lead and tin at iota is less than .00005 G the dominant creep mechanism changes from climb mechanism to Harper-Dorn creep, a type of viscous deformation first reported in pure aluminum at high temperature and low stress. It is characterized by a creep rate which is linearly dependent on the applied stress and apparently independent of grain size. Author

N73-30513# Cornell Univ., Ithaca, N.Y. Materials Science Center.
EFFECT OF ENVIRONMENT ON FATIGUE CRACK PROPAGATION IN 4340 STEEL M.S. Thesis
Roger C. Rowlands Sep. 1972 68 p refs
(Contract AT(11-1)-3166)
(COO-3166-4; Rept-1948) Avail: NTIS HC $5.50

Environmental fatigue crack growth rate studies were conducted with a 4340 steel treated to several different yield strengths in hydrogen, argon, room air, and a .4% by volume oxygen-hydrogen atmosphere at frequencies of 5. .5, and .05 cycles per second. The fracture mechanics approach was used. A decrease in the severity of the hydrogen induced cracking with a decrease in the materials yield strength was observed. The beneficial effect of a small oxygen addition to the aggressive hydrogen atmosphere was demonstrated. It was proposed that this was due to the preferential adsorption of an oxide film on the crack tip surface which cyclically ruptures and reforms, hence preventing a damaging amount of hydrogen from being adsorbed and diffusing to the point of maximum stress triaxiality. Author

N73-30514# Maryland Univ., College Park. Dept. of Mechanical Engineering.
STUDY OF ALLOY STRENGTHENING DUE TO ATOMIC ORDER Progress Report, 1 May 1972 - 30 Apr. 1973
M. J. Marcinkowski 1973 280 p refs
(Contract AT(40-1)-3935)
(ORO-3935-25) Avail: NTIS

A study was made of dislocation behavior of ordered and disordered alloys using computer models. In particular, the mechanism for generating ordering dislocations at low temperature in CsCl superlattices with their subsequent generation of antiphase boundaries was studied. In addition, the simultaneous motion of dislocations in the presence of a continuously ordering alloy was studied using computer techniques. Author

N73-30515# Cornell Univ., Ithaca, N.Y. Materials Science Center.
FLUCTUATION DIAMAGNETISM OF ALUMINUM AND ALUMINUM ALLOYS ABOVE THE SUPERCONDUCTING TRANSITION TEMPERATURE Ph.D. Thesis
J. H. Claassen Jan. 1973 142 p refs Sponsored by AEC
(COO-3156-56) Avail: NTIS HC $9.25

Thermodynamic fluctuations in the order parameter phi were shown to produce a small diamagnetic response at temperatures above the superconducting transition temperature. Gollub, Beasley and Tinkham (GBT) have measured this effect for Pb and In, both pure and with impurities. The functional behavior and values of Hs observed by GBT could not be explained satisfactorily with any theory based on the Ginzburg-Landau formulation. This effect was measured in both pure Al and Al alloys of solute concentration 0.05 and 0.15 at.% Ag and 0.1, 0.3, 0.5, and 0.8 at.% Si. The apparatus used for these measurements included a SQUID magnetometer in a configuration similar to that of GBT which allowed a resolution in sample magnetization of 2 x 10 to the minus 9th power Gauss. The fluctuation magnetization was separated from other contributions by the fact that it is temperature dependent and is completely quenched in sufficiently high fields or temperatures. The apparatus could operate in fields H > 100 Oe and allowed the sample temperature to be raised as high as 5 K. Author (NSA)

N73-30516# Michigan Univ., Ann Arbor.
THERMODYNAMIC PROPERTIES OF SOLID ALLOYS OF CHROMIUM WITH NICKEL AND IRON Final Report
F. N. Mazandarany and R. D. Pehlke 1972 45 p refs
(Contract AT(11-1)-1791)
(COO-1791-4) Avail: NTIS HC $4.25

The thermodynamic properties of chromium were determined in the Ni-Cr and Fe-Cr binary systems and in the Fe corner of the Fe-Ni-Cr system. These properties are based on experimental measurements using solid oxide electrolyte cells of the type: Cr, Cr2O3/ThO2- Y2O3/Cr (alloy), Cr2O3. NSA

N73-30517# Central Electricity Generating Board, Berkeley (England). Nuclear Labs.
STUDY OF CORROSION AND DEPOSITION IN LIQUID METALS. PART 1: OBSERVATIONS ON WEDGING CORROSION AND MASS TRANSPORT IN THE SYSTEM ZIRCONIUM/SODIUM/STAINLESS STEEL AT 650 C

S. B. Fisher and A. J. Hooper Dec. 1972 15 p refs (RD/B/N-2521-Pt-1) Avail: AEC Depository Libraries HC $3.00

The use of zirconium metal at high temperatures in the purification of sodium has been widely reported. Results of a study are given of the interaction between zirconium metal samples and sodium containing an initially high concentration of dissolved oxygen, in which x-ray diffraction, energy dispersive analytical x-ray (EDAX), e.p.m.a. were used to examine zironcium samples following sodium exposure. Large Na/Zr/O particle growths were observed and this was ascribed to Na2ZrO3 formation and consequent wedging corrosion of the zirconium. This wedging corrosion mechanism may lead to degradation of the zirconium foil, which could cause operational difficulties. The observed mass transfer of constituent elements of stainless steel to the zirconium is also discussed. Author (NSA)

N73-30518# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.

CONTRIBUTION TO THE STUDY OF THE STABILITY OF COLD-WORKED AUSTENITIC STEELS, PARTICULARLY DURING CREEP TESTS: INFLUENCE OF CARBON-STABILIZING ELEMENTS

J.-N. Calvert, P. Petrequin, M. Weisz, and A. Badard 1972 56 p refs In FRENCH Presented at Autumn Meeting on Met., Chatenay-Malabry, France, 2 Oct. 1972

(CEA-Conf-2119; Conf-721063-5) Avail: AEC Depository Libraries

Tests were made to determine precisely the creep of 316 austenitic stainless steel, its temperature domain, and the marked resistance of cold work steel to corrosion in high temperature range. Studies were also conducted on the maintenance statistics of steel after cold working at 20 C, and the influence of carbon-stabilizing elements on Ti and Nb creep stability characteristics. Transl. by E.H.W.

N73-30519# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany).

DIRECTIONALLY SOLIDIFIED CO-CR-C-COMPOSITES. MICROSTRUCTURE AND STRENGTH BETWEEN 20 AND 1050 C OBTAINED BY DIFFERENT SOLIDIFICATION MODES

Klaus Fritscher, Guenter Wirth, and Wolfgang Bunk 23 Jan. 1973 56 p refs In GERMAN; ENGLISH summary

(DLR-FB-73-37) Avail: NTIS HC $5.00; DFVLR, Porz, West Ger. 19, 50 DM

Alloys of the system CO-Cr-C containing the phases gamma Co,Cr and (Cr,Co)7C+3 were directionally solidified using the Bridgman technique. The resulting microstructures were investigated in relation to solidification rate, temperature gradient, and composition. In the case of a directionally solidified hypereutectic alloy containing 32.5 v/o carbide fibers, tensile tests were performed between room temperature and 1050 C, and tensile strength, elongation, and fracture appearence were determined. Room temperature tensile strength depends on fiber distance and cell formation, whereas the high temperature strength is a function of fiber distance only. Elongation to fracture is minimized at medium temperatures. Author (ESRO)

N73-30520# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE THERMOPLASTIC STRENGTHENING OF MARTENSITE STEELS AND TITANIUM ALLOYS

M. Kh. Shorshorov, L. K. Gordienko, and V. I. Antipov 24 Apr. 1973 141 p refs Transl. into ENGLISH from the monograph "Termoplasticheskoe Uprochnenie Martensitnykh Stalei i Titanovykh Splavov" Moscow, 1971 p 9-80

(AD-760953; FTD-MT-24-1778-72) Avail: NTIS CSCL 11/6

Contents: Processes for the hardening and stabilizing of the structural state of metals and alloys; Low-temperature thermomechanical processing of high-strength martensitic steels with polygonization. GRA

N73-30521# Air Force Materials Lab., Wright-Patterson AFB, Ohio.

THE EFFECT OF THERMAL CYCLING ON THE Co-Co3Cb EUTECTIC Technical Report

H. L. Arnson Dec. 1972 152 p refs

(AF Proj. 7351)

(AD-763706; AFML-TR-72-286) Avail: NTIS CSCL 11/6

Unidirectionally solidified Co-Co3Cb eutectic samples with and without a minor addition nickel were subjected to long time annealing and thermal cycling treatments. The eutectic showed metallographic and crystallographic stability after vacuum annealing for periods up to 1000 hours at 1000C. Structural stability was also observed during thermal cycling experiments conducted completely above the temperature of the cobalt FCC to HCP, HCP to FCC phase transformation. However, when the thermal cycle included the cobalt transformation temperature, samples containing 0.2 weight per cent nickel showed microstructural breakdown, whereas samples with 0.01 weight per cent nickel did not. In addition, the latter samples quickly developed and retained the FCC form of cobalt during cycling. (Modified author abstract) GRA

N73-30522# Army Foreign Science and Technology Center, Charlottesville, Va.

FORMATION OF SOLID SOLUTIONS AND FLUIDITY OF ALLOYS BASED ON ALUMINUM AND TITAN

12 Mar. 1973 10 p refs Transl. into ENGLISH from an unidentified Russian monograph

(AD-763491; FSTC-HT-23-1641-72) Avail: NTIS CSCL 11/6

An understanding of the rules governing the dissolution of additions of different elements in an alloy base as a function of their position in the periodic Mendeleyev system is of great practical and theoretical importance. Data on the solubility limits in a solid state in aluminum, titanium, and iron are given and others. This article is devoted to clarifying these rules, taking into account the atomic and crystal structure of elements for alloys on an aluminum and titanium base. An attempt is made simultaneously to establish the rules governing the influence of these additions on the technological properties of alloys, particularly the fluidity of alloys. Author (GRA)

N73-30523# Connecticut Univ., Storrs. Dept. of Metallurgy.

ON THE INFLUENCE OF THE R-RATIO ON FATIGUE CRACK PROPAGATION

A. J. McEvily, R. Kumble, and R. J. Donahue Feb. 1973 17 p refs

(Contract F44620-69-C-0011; AF Proj. 9560)

(AD-763776; UC-Met-2-73; AFOSR-73-1148TR) Avail: NTIS CSCL 11/6

A model of the fatigue crack growth process based on crack opening displacement considerations has been previously applied successfully to crack growth under R = O type loading. (R = is the ratio of the minimum to the maximum stress of a loading cycle). The present work extends the approach to include other R ratios. A comparison of experimental results indicates crack closure effects influence the crack growth behavior. A modification of the expression for crack growth to reflect crack closure is proposed. This expression is in better agreement with experiment. Author (GRA)

N73-30524# Northwestern Univ., Evanston, Ill.

SOLID SOLUTION STRENGTHENING AND DISPERSION HARDENING IN DILUTE TITANIUM ALLOYS Technical Report, 15 Jan. 1971 - 15 Jan. 1973

Takeo Sakai and Morris E. Fine Jun. 1973 133 p refs

(Contract F33615-71-C-1252; AF Proj. 7351)

(AD-763785; AFML-TR-73-131) Avail: NTIS CSCL 11/6

The purpose of the research was to determine the effect of aluminum on the fundamental mechanical properties of titanium and how such changes are related to the emergence of aluminum as the principal alloying element for titanium. A clearer understanding of the role of aluminum in enhancing the engineering mechanical properties of titanium, it is hoped, would point the way toward development of improved alloys. The report concludes with a discussion of the results from this point of view. GRA

N73-30525# Rensselaer Polytechnic Inst., Troy, N.Y. Materials Div.

THE EFFECT OF MEAN STRESS AND ENVIRONMENT ON CORROSION FATIGUE BEHAVIOR OF 7075-T6 ALUMINUM

L. V. Corsetti and D. J. Duquette 10 Apr. 1973 31 p refs

(Contract N00014-67-A-0117-0012; NR Proj. 036-093)
(AD-763455; TR-2) Avail: NTIS CSCL 11/6

Axial fatigue tests were performed on a 7075-T6 aluminum alloy in tension-compression and under superimposed positive mean stresses in dry air and in aqueous 0.5N NaCl solution. Both corrosive environments and positive mean stresses resulted in lower fatigue lives but no interaction between these variables was observed. Crack initiation in air occurred at electropolish pits at inclusion/alloy interfaces and propagated primarily in a Stage I (crystallographic) mode. A model for environment assisted cracking is presented which suggests that hydrogen induced cleavage is responsible for the degradation in fatigue properties of this alloy. (Modified author abstract) GRA

N73-30526# Rockwell International Science Center, Thousand Oaks, Calif. Science Center.
DEFORMATION AND SOLID SOLUTION STRENGTHENING OF Ti-V ALLOYS
R. G. Baggerly, N. E. Paton, and J. C. Williams 29 Jun. 1973 36 p refs
(Contract N00014-71-C-0363)
(AD-763429) Avail: NTIS CSCL 11/6

The deformation and aging characteristics of Ti-V alloys and Ti-12 1/2 w/o Mo alloy were investigated. Single crystals of Ti-30V, Ti-40V and Ti-12 1/2 Mo were used to study deformation behavior for the solid solution condition and after an aging treatment. The critical resolved shear stress for slip or twinning was determined as a function of temperature for these crystals. Optical trace analysis was used to identify the active slip or twinning plane and thin foil electron microscopy was used to identify aging products. X-ray precession camera techniques were occasionally used to corroborate results. Tests were also conducted to determine the effect of grain size on yield stress and work hardening behavior in Ti-20V, Ti-30V, and Ti-40V alloys. GRA

N73-30527# Nolit Publishing House, Belgrade (Yugoslavia).
MINING AND METALLURGY QUARTERLY, NUMBER 4, 1970
1972 79 p refs Transl. into ENGLISH from Rudarsko-Met. Zbornik (Ljubljana), no. 4, 1970 p 369-444 Prepared for NSF (TT-70-56005/4) Avail: NTIS HC $4.85 CSCL 11F

Contents: Graphical adjustment of triangulation III; some applications of distribution theory to the study of vibrating percussive motion; motion of a fiber under the influence of percussive forces; influence of variability of flow resistance in mine airways on the calculation of ventilation; viewpoints concerning maintenance in opencut mining; influence of K2CO3 and Na2CO3 on the reduction of iron ore; and relationship between hot workability of low carbon steels and distribution of aluminum and nitrogen. GRA

N73-30528# National Science Foundation, Washington, D.C.
ON THERMODYNAMICS IN METALLURGY 1
Anton Podgornik 1972 14 p Transl. into ENGLISH from Rudarsko-Met. Zbornik (Ljubljana), no. 2, 1957 p 95-108
(TT-71-56066) Avail: NTIS HC $3.00 CSCL 07D

The main lines of development of metallurgical thermodynamics today are presented. The general theory was dealt with only in barest outlines. Procedures are described by which the thermodynamic values can be measured. GRA

N73-30529# Army Materials and Mechanics Research Center, Watertown, Mass. Metals Research Div.
HOT SALT STRESS CORROSION OF TITANIUM ALLOYS IN AN ADJUSTABLE DEFLECTION, MULTI-SPECIMEN BENT BEAM TEST APPARATUS
Anthony K. Wong and Milton Levy Mar. 1973 44 p refs
(Contract DAAG46-73-M-1401; DA Proj. 1T0-61102-B-32A)
(AD-763704; AMMRC-TR-73-10-7303) Avail: NTIS CSCL 11/6

An adjustable deflection, multi-specimen, bent beam test fixture was devised for conditioning sheet specimens used in the investigation of hot salt stress corrosion effects in titanium alloys. Initial tests were conducted with a Ti-5Al-2.5Sn titanium alloy at a temperature of 900F and a stress just below the yield strength. Crack developments on salt-treated surfaces were observed to increase with exposure time of 150, 500 and 1000 hours. In addition, deleterious effects of orientation and overstress were also observed. Later, efforts were made to evaluate a proprietary boron carbide coating at exposure time up to 500 hours. Preliminary results indicated the potential of the coating. (Modified author abstract) GRA

N73-30530# Philco-Ford Corp., Newport Beach, Calif. Aeronutronic Div.
ACOUSTIC EMISSION FROM FERROUS MARTENSITES
Kanji Ono (Calif. Univ., Los Angeles), T. C. Schlotthauer (Calif. Univ., Los Angeles), and T. J. Koppenaal Jul. 1973 20 p refs
(Contract N00014-70-C-0223; NR Proj. 031-742)
(AD-763443; TR-4) Avail: NTIS CSCL 11/6

Acoustic Emission (AE) during martensitic transformation of two Fe-Ni-C alloys (31.4 Ni-0. 03C and 22 Ni-0.44 C) was investigated as a function of their thermomechanical history. The use of AE technique for M sub s temperature determination in steel alloys is discussed. This study was a part of an alloy development program and demonstrated the merit of AE technique for this application. In all, 15 different steel compositions were examined. GRA

N73-30531# Rensselaer Polytechnic Inst., Troy, N.Y.
CREEP BEHAVIOR OF AN ALIGNED Ag3Mg-AgMg EUTECTIC
Y. G. Kim and N. S. Stoloff 1 Jul. 1973 29 p refs
(Contract N00014-67-A-0117-0010; NR Proj. 031-745)
(AD-763375; TR-3) Avail: NTIS CSCL 11/6

Creep properties of an aligned Ag3Mg-AgMg eutectic alloy have been determined as a function of growth speed and degree of long range order in the Ag3Mg phase. Apparent activitation energies for steady state creep were determined and compared with those for the constituent phases. Long range order reduces creep rate of the eutectic; finer interlamellar spacings produce a similar effect. Fractographic features of creep-rupture specimens are discussed. Author (GRA)

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N73-30532* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SEMICONDUCTOR SURFACE PROTECTION MATERIAL
Patent
Richard D. Packard, inventor (to NASA) Issued 10 Jul. 1973 3 p Filed 5 Jun. 1970 Supersedes N70-36075 (08 - 19, p 3563)
(NASA-Case-ERC-10339-1; US-Patent-3,745,082; US-Patent-Appl-SN-43883; US-Patent-Class-156-285) Avail: US Patent Office CSCL 11C

A method and a product for protecting semiconductor surfaces is disclosed. The protective coating material is prepared by heating a suitable protective resin with an organic solvent which is solid at room temperature and converting the resulting solution into sheets by a conventional casting operation. Pieces of such sheets of suitable shape and thickness are placed on the semiconductor areas to be coated and heat and vacuum are then applied to melt the sheet and to drive off the solvent and cure the resin. A uniform adherent coating, free of bubbles and other defects, is thus obtained exactly where it is desired.
Official Gazette of the U.S. Patent Office

N73-30533# Aeronautical Research Labs., Melbourne (Australia).
THE FABRICATION AND PROPERTIES OF CARBON FIBRE REINFORCED GLASS COMPOSITES
E. J. Lumley Nov. 1972 14 p refs
(ARL/Met-Note-85) Avail: NTIS HC $3.00

The fabrication and properties of carbon-fiber glass composites are discussed. Test specimens were prepared by a vacuum hot

pressing of mixtures of aligned carbon fibers and finely divided glass powder. Fiber reinforcement resulted in substantial strengthening of the glass matrix. Methods for improving the mechanical properties of the composite are proposed. Author

N73-30534# Bureau of Mines, Albany, Oreg. Metallurgy Research Center.
THERMODYNAMIC PROPERTIES OF THREE SODIUM TITANATES
K. O. Bennington and R. R. Brown 1973 16 p refs
(BM-RI-7778) Avail: NTIS HC $3.00

Enthalpies of formation of three sodium titanates were determined by hydrofluoric acid solution calorimetry. The values obtained for formation from the elements at 298.15 K are -370.9 + or - 0.5 kcal/mole for Na2Ti03, -832.1 + or - 0.9 kcal/mole for Na2Ti3O7, and -1510.9 + or - 1.7 kcal/mole for Na2Ti6O13. Tables of enthalpies of formation and Gibbs energies of formation are given as a function of temperature both from the elements and from the component oxides for Na2Ti03 and Na2Ti3O7. Author

N73-30535*# North Dakota State Univ., Fargo. Dept. of Polymers and Coatings.
QUANTITATION OF BURIED CONTAMINATION BY USE OF SOLVENTS Semiannual Report, 1 Jan. - 30 Jun. 1973
S. Peter Pappas, Paul Hsiao, and Loren W. Hill 30 Jun. 1973 45 p refs
(Grant NGR-35-001-012)
(NASA-CR-133645) Avail: NTIS HC $4.25 CSCL 11D

A method for determining the quantity of buried contamination using solvents is presented. A nonsporocidal method with which high spore recoveries are achievable from silicone coatings and potting compounds was developed. An extension of the method to silicon potting compound RTV 60 is reported. It is stated that spores remain viable during chemical curing of silicone potting compounds and more than ninety percent of the spore population is recoverable by amine dissolution and proper plating techniques. Author

N73-30536*# Ampex Corp., Redwood City, Calif.
A METHOD FOR MAKING CONDUCTORS FOR FERRITE MEMORY ARRAYS Patent Application
Clarence H. Heckler, Jr., Paul D. Baba, and Nathan E. Bhiwanker, inventors (to NASA) Filed 22 Aug. 1973 11 p
(Contract NAS1-8170)
(NASA-Case-LAR-10994-1; US-Patent-Appl-SN-390466) Avail: NTIS HC $3.00 CSCL 11D

The ferrite memory arrays are made from pre-formed metal conductors for the ferrite arrays. The conductors are made by forming a thin sheet of a metallizing paste of metal alloy powder, drying the paste layer, bisque firing the dried sheet at a first temperature, and then punching the conductors from the fired sheet. During the bisque firing, the conductor sheet shrinks to 58% of its pre-fired volume and the alloy particles sinter together. The conductors are embedded in ferrite sheet material and finally fired at a second higher temperature during which firing the conductors shrink approximately the same degree as the ferrite material. NASA

N73-30537*# Case Western Reserve Univ., Cleveland, Ohio.
THE EFFECT OF THERMAL CYCLING ON THE STRUCTURE AND PROPERTIES OF A Co, Cr, Ni-TaC DIRECTIONALLY SOLIDIFIED EUTECTIC COMPOSITE
F. M. Dunlevey and J. F. Wallace 1 Sep. 1973 79 p refs
(Grant NGR-36-027-035)
(NASA-CR-121249) Avail: NTIS HC $6.00 CSCL 11D

The effect of thermal cycling on the structure and properties of a cobalt, chromium, nickel, tantalum carbide directionally solidified eutectic composite is reported. It was determined that the stress rupture properties of the alloy were decreased by the thermal cycling. The loss in stress rupture properties varied with the number of cycles with the loss in properties after about 200 cycles being relatively high. The formation of serrations and the resulting changes in the mechanical properties of the material are discussed. Author

N73-30538*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.
LONG-TIME DYNAMIC COMPATIBILITY OF ELASTOMERIC MATERIALS WITH HYDRAZINE
C. D. Coulbert, E. F. Cuddihy, and R. F. Fedors 1 Sep. 1973 28 p refs
(Contract NAS7-100)
(NASA-CR-133794; JPL-TM-33-650) Avail: NTIS HC $3.50 CSCL 11D

The tensile property surfaces for two elastomeric materials, EPT-10 and AF-E-332, were generated in air and in liquid hydrazine environments using constant strain rate tensile tests over a range of temperatures and elongation rates. These results were used to predict the time-to-rupture for these materials in hydrazine as a function of temperature and amount of strain covering a span of operating times from less than a minute to twenty years. The results of limited sheet-folding tests and their relationship to the tensile failure boundary are presented and discussed. Author

N73-30539*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OXIDATION RESISTANCE OF SELECTED MECHANICAL CARBONS AT 650 DEG C IN DRY FLOWING AIR
Gordon P. Allen and Donald W. Wisander Washington Sep. 1973 18 p refs
(NASA-TN-D-7381; E-7033) Avail: NTIS HC $2.75 CSCL 11D

Oxidation experiments were conducted with several experimental mechanical carbons at 650 C in air flowing at 28 cu cm/sec (STP). Experiments indicate that boron carbide addition and zinc phosphate treatment definitely improved oxidation resistance. Impregnation with coal tar pitch before final graphitization had some beneficial effect on oxidation resistance and it markedly improved flexure strength and hardness. Graphitization temperature alone did not affect oxidation resistance, but with enough added boron carbide the oxidation resistance was increased although the hardness greatly decreased. Author

N73-30540*# Washington Univ., Seattle. Ceramic Engineering Div.
INTERDISCIPLINARY RESEARCH CONCERNING THE NATURE AND PROPERTIES OF CERAMIC MATERIALS Semiannual Status Report, 16 Dec. 1972 - 15 Jun. 1973
James I. Mueller 15 Jun. 1973 50 p refs
(Grant NGL-48-002-004)
(NASA-CR-133741; SASR-20) Avail: NTIS HC $4.50 CSCL 11B

Research projects involving the development of ceramic materials are discussed. The following areas of research are reported: (1) refractory structural ceramics, (2) solid electrolyte ceramics, and (3) ceramic processing. The laboratory equipment used and the procedures followed for various development and evaluation techniques are described. Author

N73-30541*# Tennessee Univ., Tullahoma. Space Inst.
THE EFFECTS OF ELEVATED TEMPERATURES ON THE STRUCTURAL PROPERTIES OF FIBER COMPOSITE MATERIALS SUITABLE FOR USE IN SPACE SHUTTLE AND OTHER SPACE VEHICLES Final Report, 1 Jul. 1971 - 15 Oct. 1972
Maurice A. Wright Oct. 1972 177 p refs
(NASA-CR-124369) Avail: NTIS HC $11.00 CSCL 11D

The effects of high temperatures on the structural properties of fiber composite materials for use in spacecraft structures are investigated. Various mechanical properties of boron reinforced aluminum alloys were measured. It was observed that cycling these materials through temperatures that varied from room temperature to 425 C could seriously degrade the properties. The extent of the observed effects depended on alloy type and the maximum cyclic temperature used. Results are discussed in terms of upper and lower strength bonds calculated from the strengths of individual fibers. Author

N73-30542*# General Dynamics/Convair, San Diego, Calif. Aerospace Div.
PREPARATION OF COMPOSITE MATERIALS IN SPACE. VOLUME 1: EXECUTIVE SUMMARY Final Report
W. H. Steurer and S. Kaye Jan. 1973 25 p
(Contract NAS8-27806)

(NASA-CR-124365; GDCA-DBG73-001-Vol-1) Avail: NTIS HC $3.25 CSCL 11D

The reported objectives were to define promising materials, to obtain significant processing criteria and the related processing techniques and apparatus for the preparation of composites in space, and to establish a program for zero-g experiments and the required developmental efforts. Preparation was studied of the following composite types: (1) metal-base fiber and particle composites, including cemented compacts, (2) controlled density metals, comprising plain and reinforced metal foams, and (3) unidirectionally solidified eutectic alloys. The zero-g environment of obital operations offers the capability to produce metal-base composite materials and castings which exhibit properties and, particularly, unique combinations of properties that cannot be achieved in terrestrial production. Author

N73-30543# Oak Ridge National Lab., Tenn.
IRRADIATION OF GRAPHITE AT 950 C
C. R. Kennedy [1973] 7 p Presented at 11th Biennial Conf. on Carbon, Gatlinburg, Tenn., 4 Jun. 1973 Sponsored by AEC
(Conf-730601-5) Avail: NTIS HC $3.00

Graphites of three types, conventional, carbon black, and apparently binderless, have been irradiated in HFIR at 950 C and the results compared with those obtained at 715 C. It is demonstrated that no growth rate increases are evident; however, the lifetime appears to be reduced. The implication is that at 950 C graphites have a reduced ability to absorb the differential growth-induced shear stress. Author

N73-30544# Oak Ridge National Lab., Tenn.
DEVELOPMENT OF RADIATION RESISTANT INSULATORS Final Report, 1 Jul. 1966 - 15 Jan. 1972
W. W. Parkinson and M. J. Kelly Feb. 1973 107 p refs
(Contract W-7405-eng-26)
(ORNL-4842) Avail: NTIS HC $3.00

The electrical properties of capacitor insulation (the critical component in ion-chamber, quartz-fiber, dosimeters) were related to theories of conduction and dielectric relaxation in insulators. A general survey revealed that a K2S2O8-initiated, emulsionpolymerized copolymer of styrene and alpha-methyl styrene had a uniquely rapid decay of conductivity following irradiation. This decay of conductivity resulted from removal of mobile charge carriers (identified as electrons or holes) by a polar phase uniformly dispersed through the polymer by association with sulfate chain ends. A recipe for polymerization of a styrene monopolymer having such trapping species was optimized for moisture sensitivity and fabrication characteristics. Rapid decay was also achieved by incorporation of organic phosphites in solution-cast plastic films. It was found that acid groups (methacrylic, maleic) copolymerized with styrene were without effect on postirradiation conductivity. Author (NSA)

N73-30545# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Material und Festkoerperforschung.
CREEP BEHAVIOR OF POLYCRYSTALLINE ALUMINUM OXIDE AND Al2O3/Cr CERMETS
G. Engelhardt Jan. 1973 148 p refs In FRENCH; ENGLISH summary
(KFK-1753) Avail: AEC Depository Libraries HC $9.50

Described are creep experiments with a four-point-load bending machine carried out on pure polycrystalline alumina and Al2O3-Cr-cermets (10, 20, 30, 40 and 50 vol.-% Cr). The specimens were prepared by powder techniques with densities in the range of 95-98% TD. The grain size of the Al2O3-matrix decreased with increasing Cr-content; it was about 12 microns for the alumina and 5 microns for samples with 70/30-vol.-% Al2O3/Cr and above. The creep tests were run in the temperature range $1280 < T < 1600$ C. After a period of transient creep, the further deformation was steady state in all cases. Variations of creep strain rate with stress and temperature were measured using the incremental stress and temperature method. Individual measurements on porous cermets showed, that porosity results in a further increase in the creep rate. It did not, however, reveal any measurable influence on the activation energy for creep. Author

N73-30546# Royal Netherlands Aircraft Factories Fokker, Amsterdam. Manufacturing Research and Product Development Dept.
INVESTIGATION OF THE INFLUENCE OF OUTDOOR WEATHERING ON THE MECHANICAL PROPERTIES AND THE QUALITY OF APPEARANCE OF SEVERAL GLASS-CLOTH REINFORCED THERMOSETTING RESIN LAMINATES Interim Report
R. Scheltes 6 Mar. 1973 70 p
(FOK-R-1627) Avail: NTIS HC $5.50

Changes in the flexural strength properties and appearance of the surface of solid polyester and epoxy glasscloth reinforced laminates which are applied in primary and secondary constructions in the F-27 and F-28 aircraft, by means of outdoor weathering, were determined. As parameters several manufacturing methods were introduced under different circumstances such as variation of time and/or temperature curing, variation of the atmospheric environment, such as temperature and humidity of the air, and the presence or absence of paint scheme on the exterior surface of the laminate. ESRO

N73-30547# Defense Documentation Center, Alexandria, Va.
REFRACTORY COATINGS Report Bibliography, Apr. 1959 - Jun. 1972
Jul. 1973 175 p refs Supersedes AD-720203
(AD-763150; AD-720203; DDC-TAS-73-29) Avail: NTIS CSCL 11/3

The bibliography contains unclassified and unlimited reports on Refractory Coatings in industrial processing. Computer-generated indexes to Corporate Author-Monitoring Agency, Subject, Title, and Personal Author are provided. Author (GRA)

N73-30548# Army Materials and Mechanics Research Center, Watertown, Mass.
A REVIEW OF CONTROLLING CONSTITUENT PROPERTIES AS RELATED TO THE STRENGTHENING OF GRAPHITE FIBER-REINFORCED ALUMINUM AND MAGNESIUM COMPOSITES
Albert F. Grenis Apr. 1973 22 p refs
(DA Proj. 1T0-62105-A-331)
(AD-763211; AMMRC-TR-73-19) Avail: NTIS CSCL 11/4

An important consideration for strengthening graphite fiber-reinforced materials involves the study of fiber content, fiber strength distribution, and fiber fracture characteristics within the matrix material. A review of controlling constituent properties as related to the strengthening of graphite fiber-reinforced aluminum and magnesium composties was made. The parameters of interest included weight fraction, volume fraction, density, stress, strain, modulus, and fiber strength distribution. Author (GRA)

N73-30549# General Dynamics/Fort Worth, Tex. Convair Aerospace Div.
RELIABILITY PREDICTION FOR ADHESIVE BONDS Technical Report, 15 Feb. 1971 - 15 Mar. 1972
R. V. Wolff and G. H. Lemon Oct. 1972 75 p refs
(Contract F33615-71-C-1351 ; AF Proj. 7340)
(AD-763707; AFML-TR-72-121) Avail: NTIS CSCL 13/5

A study was made toward the development of a reliability approach applicable to the design of adhesive bonded joints, specifically laminate-to-metal joints. An approach to evaluation of the strength/lifetime of bonded joints through use of a random (load-by-load) fatigue spectrum and a reliability analysis is reported. The analysis centers on two lifetime characterization models--maximum load versus lifetime and residual strength versus lifetime. Test data presented includes static and lifetime data for titanium-to-titanium and graphite laminate-to-titanium overlap bonded joints. Lifetime data includes constant amplitude, random tension, and random tension plus GAG loadings. A model proposed by Dr. J. C. Halpin for describing distributions of residual static strength and fatigue life was evaluated using the empirical data of this program, and the model was found to give reliable estimates. A scale effect was observed for both static and lifetime conditions in comparing results of component elements to those of coupon-size specimens. (Modified author abstract) GRA

N73-30550# Washington Univ., St. Louis, Mo.
COMPUTER-AIDED MECHANICAL TESTING OF COMPOSITES Technical Report, Jan. 1970 - Jan 1971
E. M. Wu and K. L. Jerina Nov. 1972 40 p refs
(Contract F33615-69-C-1404; AF Proj. 7342)

(AD-763708; AFML-TR-72-243) Avail: NTIS CSCL 11/4

The report describes the development of a testing system using small real-time computers for characterizing the mechanical properties of composites. Specifically, major system requirements for the deformation and strength properties of anisotropic composites are discussed. Motion pictures are used to view the fracture of the thin-walled graphite/epoxy composite to confirm the computer analysis. Author (GRA)

N73-30551# Naval Research Lab., Washington, D.C.
EFFECT OF TEMPERATURE AND STRAIN RATE ON THE TENSILE PROPERTIES OF ALUMINUM-BORON, EPOXY-BORON, AND EPOXY-GRAPHITE COMPOSITES Final Report
D. A. Meyn and P. Shahinian Jun. 1973 37 p refs
(AD-763656; NRL-MR-2609) Avail: NTIS CSCL 11/4

The effects of strain rates from 0.00008 to 0.4/sec on tensile strengths and moduli of 6061 aluminum-46.5 v/o boron at temperatures up to 1000F, of unidirectional and cross-ply epoxy-50 v/o boron composites at temperatures up to 500F and of cross-ply epoxy-60 v/o graphite composites at temperatures up to 250F have been measured. Longitudinal properties were reduced moderately at high temperatures, and were only slightly higher at high strain rates than at low strain rates. Transverse properties decreased rapidly with temperature, and were either unaffected by high strain rates, particularly at low temperatures, or were substantially increased, especially at high temperatures, in both aluminum-and epoxy-based systems.
Author (GRA)

N73-30552# IIT Research Inst., Chicago, Ill.
FATIGUE PROPERTIES OF GRAPHITE/GLASS/EPOXY COMPOSITES Final Report, 9 Feb. 1972 - 9 Feb. 1973
Nagaraja Rao and K. E. Hofer, Jr. Apr. 1973 138 p refs
(Contract N00019-72-C-0294)
(AD-763760; IITRI-D6070) Avail: NTIS CSCL 11/4

The specific objective of the program was to use a commercially available glass and commercially available high strength and high modulus graphite fibers with a common epoxy matrix to maximize the technical performance of the hybrid composite in fatigue applications. (Modified author abstract) GRA

N73-30553# Philco-Ford Corp., Newport Beach, Calif. Aeronutronic Div.
DEVELOPMENT OF IMPROVED GRAPHITE FIBER COMPOSITES Final Report, 14 Apr. 1972 - 11 May 1973
John L. Perry, Michael Damoth, and Jim P. Pope 11 May 1973 145 p refs
(Contract N00019-71-C-0166)
(AD-763376) Avail: NTIS CSCL 11/4

The work explored potential avenues for maximizing the impact strength of advanced graphite composites without significantly affecting other directional strength properties or producing significant weight penalties. The approach involved the incorporation of third phase supplementary thin ply reinforcement added to the basic graphite composite. Materials which were evaluated were PRD-49, Thornel 400, and S-2 glass yarns. A potential second area of impact improvement which was investigated involved the use of boron and boron compounds as a graphite fiber surface treatment to improve interfacial (resin-fiber) bonding properties in the composites. The most promising third phase additive was S-2 glass yarn which increased the impact strength of a graphite composite 550% for a 25% fiber volume composite and 260% for a 10% fiber volume composite. Instrumented Charpy impact strengths were determined for selected composites. Ultimate loads and load versus time data demonstrated the large energy absorbtion characteristics of the hybrid composites and identified and delineated significant and subtle differences in fracture energy levels. Author (GRA)

N73-30554# Horizons Research, Inc., Cleveland, Ohio.
ELASTOMERS FOR SERVICE WITH ENGINE LUBRICANTS AND HYDRAULIC FLUIDS Final Report, 13 Apr. 1972 - 12 Apr. 1973
Kennard A. Reynard, Richard W. Sicka, John C. Vicic, and Selwyn H. Rose Jun. 1973 49 p refs
(Contract N00019-72-C-0419)
(AD-762800) Avail: NTIS CSCL 11/10

A critical need exists for elastomeric material capable of service in synthetic or petroleum based oils and fluids over the temperature range -65 to 350F. Poly(fluoroalkoxyphosphazenes) have shown great promise for service in these environments. The report discusses the development of poly(fluoroalkoxyphosphazene) elastomers into useful compounded stocks for use as O-rings, gaskets, and seals. In the presence of hydraulic fluids and oils at temperatures of 300F and 350F, physical property values have been retained at near original values after 100-150 hours even though the fluids and oils themselves were decomposing. Compounded stocks have been developed with tensile strengths of 1100 to 2200 psi and elongations of 125 to 300% and retention of these properties under fluid aging, thermal aging in air and extended exposure to high humidity environments. Compression set values of 26% and 47% were obtained at 302F and 392F, respectively. Cured copolymers have shown considerable property retention on extended aging. Vulcanizates retained high tensile strength and elongation after 500 hours in water at 212F and 100% relative humidity. (Modified author abstract)
GRA

N73-30555# Army Foreign Science and Technology Center, Charlottesville, Va.
STRUCTURE AND STRENGTH OF POLYMERS
Valentin Evgenevich Gul 15 May 1973 371 p refs Transl. into ENGLISH of the book "Strukt. Prochnost Polimerov" Moscow, Khimiya Publ. House, 1971
(AD-763398; FSTC-HT-23-1051-73) Avail: NTIS CSCL 11/9

Soviet and foreign research on polymer strength is analyzed. The material is illustrated with experimental data obtained in destructive testing of plastics, polymeric glasses, elastomers, fibers, and solid polymeric systems with a high degree of crosslinking. Regularities of the effect of chemical structure, macromolecular dimensions and shape, and the types of supermolecular formations on polymer strength are examined. The book presents fundamental theories of the strength of solids and polymers. The last section derives functions with which the strength of composite materials can be determined. Use of mathematics in the presentation of the material is reduced to a minimum. (Modified author abstract)
GRA

N73-30556# Israel Program for Scientific Translations, Ltd., Jerusalem.
HANDBOOK OF PHASE DIAGRAMS OF SILICATE SYSTEMS. VOLUME 1: BINARY SYSTEMS. SECOND REVISED EDITION
N. A. Toropov, V. P. Barzakovskii, V. V. Lapin, and N. N. Kurtseva 1972 731 p refs Transl. into ENGLISH of the publ. "Diagrammy Sostoyaniya Silikatnykh Sistem: Spravochnik" Leningrad, Nauka, 1969 Sponsored by NSF and NBS
(TT-71-50040; ISBN-0-7065-1227-8) Avail: NTIS HC $9.00 CSCL 07D

The report reviews heterogenous equilibria in silicate and other similar systems comprising oxides, fluorides etc., in conjunction with the studies of metallic systems. Included are studies of oxide systems which were published up to 1968. The authors do not confine themselves to the compilation and classification of phase diagrams alone, but present the fullest possible description (crystallographic constants, X-ray structure, thermal constants) of the crystalline phases which could be isolated in these systems. Oxides of rare earth elements, and also oxides of commonly occurring elements in an uncommon state of valency, such as Ti2O3, WO2 etc. have been included. GRA

N73-30557# Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy and Materials Science.
MICROSTRUCTURE OF GRAPHITE FIBERS: A PRELIMINARY REPORT Technical Report, 1 Apr. 1972 - 29 May 1973
Donald R. Uhlmann, Leighton H. Peebles, Jr., and Steven B. Warner 29 May 1973 19 p refs
(Contract N00014-67-A-0204-0065)
(AD-763687; TR-1) Avail: NTIS CSCL 11/3

Graphite fibers can be prepared with different tensile strengths and moduli by altering the process conditions. Qualitative evidence of the structural differences can be observed in scanning electron micrographs of plasma etched fiber ends, but the detailed characteristics of the structures have not been determined. It

has been established, however, that graphitic materials will adsorb selected materials such as potassium bromine, ferric chloride, and the like, to form intercalation compounds. The report describes efforts to study the kinetics and mechanism of formation of the intercalation compounds in graphite fibers which have different mechanical properties, and which have been subjected to a variety of processing treatments. Preliminary studies were also carried out using scanning electron microscopy and wide angle X-ray diffraction to elucidate the structural characteristics of the fibers which are presently available. A portion of the work was also concerned with the mechanism of oxidation of the original acrylic fiber. (Modified author abstract) GRA

N73-30558# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
APPLICATION OF OPTIMALITY CRITERION TO FIBER-REINFORCED COMPOSITES
N. S. Khot, V. B. Venkayya, C. D. Johnson, and V. A. Tischler May 1973 55 p refs
(AD-763732; AFFDL-TR-73-6) Avail: NTIS CSCL 11/4

The report presents an efficient optimization method, based on an optimality criterion and a numerical search, for the minimum weight design of structures made from fiber-reinforced composite materials. A recurrence relation is derived and is incorporated into the computer program based on the displacement method of finite element analysis. The optimum design procedure takes into consideration multiple loading conditions and displacement constraints on the structure. Several sample problems consisting of both isotropic and composite elements are solved and the results are presented. Author (GRA)

N73-30559# Southwest Research Inst., San Antonio, Tex.
MECHNICAL BEHAVIOR OF FOAMED MATERIALS UNDER DYNAMIC COMPRESSION Final Report
A. Nagy, W. L. Ko, and Ulric S. Lindholm Jun. 1973 39 p refs
(SwRI Proj. 02-9062)
(AD-762490) Avail: NTIS CSCL 11/9

Dynamic compressive stress-strain data of several polymer foams obtained from uniaxial compressive tests over a wide range of loading rates are presented. For the tests with loading rates 0.001– or - strain rate – or - 1/sec, an electro-hydraulically operated tester was used, while the higher rate test data with strain rates = 1/sec were obtained by a gravity-operated drop tester. It is shown that the isothermal, uniaxial dynamic compressive stress-strain behavior of the foams tested can be described by a constitutive equation which is a power law in the strain rate. Exploratory uniaxial compressive data of an open-cell foam showing the air flow effect are also presented. Author (GRA)

N73-30560# Massachusetts Univ., Amherst. Polymer Research Inst.
OPTICAL AND MECHANICAL STUDIES OF HIGH POLYMERS Final Report, 1 May 1970 - 30 Nov. 1972
Richard S. Stein 15 Jun. 1973 14 p refs
(Contract N00014-67-A-0230-0005; NR Proj. 058-378)
(AD-762780) Avail: NTIS CSCL 11/9

The report presents a summary of principal accomplishments and a list of publications arising during the final two years of a longstanding project on the use of optical methods for the study of morphology and deformation mechanisms of high polymers. Theory, techniques and experimental results are presented for the methods of dynamic and relaxational X-ray diffraction and birefringence, infrared dichroism relaxation, and photographic and dynamic light scattering. Materials studied include polyethylene, ethylene-propylene, ethylene-methacrylic acid and ethylene-carbon monoxide copolymers, polyethylene terephthalate, and cis and trans poly 1,4 butadiene. Author (GRA)

N73-30412 Hebrew Univ., Jerusalem (Israel). Dept. of Inorganic and Analytic Chemistry.
INORGANIC IONS IN GLASSES AND POLYCRYSTALLINE PELLETS AS FLUORESCENCE STANDARD REFERENCE MATERIALS
R. Reisfeld *In* NBS Accuracy in Spectrophotometry and Luminescence Meas. May 1973 p 203-225 refs (For availability see N73-30396 21-14)
(Grant NBS-G-103)
(Paper-76A6-746)

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N73-30561 National Lending Library for Science and Technology, Boston Spa (England).
USE OF ONE METHOD OF REGULARIZATION FOR THE INTERPOLATION AND DIFFERENTIATION OF EXPERIMENTAL DATA
I. F. Dorofeev and N. A. Chichenev 1973 14 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Met. (USSR), v. 1, 1973 p 73-77 In ENGLISH and RUSSIAN
(NLL-M-21660-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The use of a simple, easily realized method of regularization is considered, which is based on the results of solving the inverse problem for an equation with retardation. The solution of the problem depends continuously on the disturbance of input deformation. An assessment is given of the accuracy of the calculations. Author

N73-30562 California Univ., Los Angeles.
ESTIMATION OF PARAMETERS FOR NONLINEARLY OBSERVED DYNAMIC SYSTEMS Ph.D. Thesis
Michael Leslie Ownby 1972 206 p
Avail: Univ. Microfilms Order No. 73-10462

The estimation of parameters for nonlinearly observed dynamic systems is considered. Given a mathematical model of a real phenomenon, consisting of a set of nonlinear ordinary differential equations with unknown constant parameters and a related set of nonlinear observation equations, the problem is to determine optimal estimates of the parameters. The parameter values which minimize the weighted least square errors between measured real data and predictions of the model are the optimal parameter estimates. The basic estimation procedure considered is quasilinearization. A deflected gradient search technique is incorporated into the quasilinearization algorithm to facilitate direct solution of the nonlinear algebraic system which results when the quasilinearization method is applied to nonlinearly observed systems. Thus, linearization of the observation equations, so that the algebraic equations can be solved by matrix inversion, is entirely avoided. The proposed method requires no matrix inversion. An example illustrates its success in solving a linearly observed system for which the matrix inversion approach fails. Dissert. Abstr.

N73-30563*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
ON DIGITAL SIMULATION OF MULTICORRELATED RANDOM PROCESSES AND ITS APPLICATIONS Ph.D. Thesis
Ajit Kumar Sinha Jul. 1973 178 p refs
(Grant NGL-47-004-067)
(NASA-CR-62092) Avail: NTIS HC $11.00 CSCL 12A

Two methods are described to simulate, on a digital computer, a set of correlated, stationary, and Gaussian time series with zero mean from the given matrix of power spectral densities and cross spectral densities. The first method is based upon trigonometric series with random amplitudes and deterministic phase angles. The random amplitudes are generated by using a standard random number generator subroutine. An example is given which corresponds to three components of wind velocities at two different spatial locations for a total of six correlated time series. In the second method, the whole process is carried out using the Fast Fourier Transform approach. This method gives more accurate results and works about twenty times faster for a set of six correlated time series. Author

N73-30564# Lockheed Missiles and Space Co., Palo Alto, Calif.
TRACKING DISRUPTION IN NONSTATIONARY SYSTEMS

G. V. Obrezkov and V. D. Razevig [1973] 32 p Transl. into ENGLISH from the book "Metody Analiza Sryva Slezheniia" Moscow, Sovetskoe Radio, 1972
Avail: NTIS HC $3.75; Natl. Translations Center, John Crerar Library, Chicago, Ill. 60616

Methods for approximating the probability of tracking disruptions in automatic control systems are examined. Topics discussed include: (1) generalization of the theory of excursions for the analysis of nonstationary systems, (2) Bubnov-Galerkin method, (3) asymptotic method, (4) method of compensating sources, and (5) extension of the method of compensating sources to nonlinear systems. F.O.S.

N73-30565*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
CONJUGATE POINT DETERMINATION FOR MULTITEMPORAL DATA OVERLAY
R. A. Emmert and C. D. McGillem Dec. 1972 190 p refs
(Contract NGL-15-005-112)
(NASA-CR-133640; TR-EE-73-5; LARS-Inform-Note-111872)
Avail: NTIS HC $11.50 CSCL 12A

The machine processing is discussed of spatially variant multitemporal data such as imagery obtained at different times which requires that these data be in geometrical registration so that the analysis processor may obtain the datum for a specified ground resolution element in each of the sets of imagery being utilized for analysis. Misregistration between corresponding subsets of imagery contains both a displacement and a geometrical distortion component. Search techniques utilizing the moduli of the Fourier Transforms are developed for estimating the coefficients of geometrical distortion components of this model. Following the correction of these distortion components, the displacement is located by the crosscorrelation of a template obtained from one set of data, termed the reference, with the second, or background data. This template, derived for the optimum discrimination of the reference data embedded in the background, is determined by the solution of a system of equations involving the reference data and the covariance matrix of these data. Author

N73-30566# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
ON THE LOCALIZATION OF EIGENSTATES IN ONE DIMENSIONAL DISORDERED CHAINS
Alexander Bogan, Jr. Aug. 1973 19 p refs Submitted for publication
(RE-461J) Avail: NTIS HC $3.00

A method is presented that permits the direct calculation of a localization parameter for the wave functions in any type of one dimensional disordered potential chain. The results agree with previous work, and extension to chains of coupled one dimensional oscillators. Electromagnetic waves in stratified media appear to be possible. Author

N73-30567*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS BY THE TAYLOR SERIES METHOD
Allan Silver and Edward Sullivan Jul. 1973 76 p refs
(NASA-TM-X-70438; X-641-73-202) Avail: NTIS HC $6.00 CSCL 12A

A programming implementation of the Taylor series method is presented for solving ordinary differential equations. The compiler is written in PL/1, and the target language is FORTRAN IV. The reduction of a differential system to rational form is described along with the procedures required for automatic numerical integration. The Taylor method is compared with two other methods for a number of differential equations. Algorithms using the Taylor method to find the zeroes of a given differential equation and to evaluate partial derivatives are presented. An annotated listing of the PL/1 program which performs the reduction and code generation is given. Listings of the FORTRAN routines used by the Taylor series method are included along with a compilation of all the recurrence formulas used to generate the Taylor coefficients for non-rational functions. Author

N73-30568# Direction de la Meteorologie Nationale, Paris (France).
THE STATISTICS OF EXTREME VALUES [SUR LA STATISTIQUES DES VALEURS EXTREMES]
J. Bessemoulin May 1973 24 p refs In FRENCH
(Mono-89) Avail: NTIS HC $3.25

An examination was made os statistical variables, their minimum, and maximum as related to meteorological parameters. Particular attention was given to temperature variables over a 20 year and a 50 year period for Paris. The Gumbel method was used for the study. E.H.W.

N73-30569*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
THE MINIMUM DISTANCE APPROACH TO CLASSIFICATION
A. G. Wacker and D. A. Landgrebe Oct. 1971 306 p refs
(Grant NGL-15-005-112)
(NASA-CR-133796; TR-EE-71-37; LARS-Inform-Note-100771)
Avail: NTIS HC $17.50 CSCL 12A

The work to advance the state-of-the-art of miminum distance classification is reported. This is accomplished through a combination of theoretical and comprehensive experimental investigations based on multispectral scanner data. A survey of the literature for suitable distance measures was conducted and the results of this survey are presented. It is shown that minimum distance classicifation, using density estimators and Kullback-Leibler numbers as the distance measure, is equivalent to a form of maximum likelihood sample classification. It is also shown that for the parametric case, minimum distance classification is equivalent to nearest neighbor classification in the parameter space. Author

N73-30570# Texas Univ., Austin. Center for Cybernetic Studies.
EXISTENCE AND REPRESENTATION OF DIOPHANTINE AND MIXED DIOPHANTINE SOLUTIONS TO LINEAR EQUATIONS AND INEQUALITIES
A. Charnes and F. Granot Jan. 1973 24 p refs
(Contracts N00014-67-A-0126-0008;
N00014-67-A-0126-0009; NR Proj. 047-021)
(AD-763384; CS-128) Avail: NTIS CSCL 12/1

In the paper the authors present necessary and sufficient conditions for the existence of solutions to more general systems of linear diophantine equations and inequalities than have previously been considered. The authors do this in terms of variants and extensions of generalized inverse concepts which also permit them to give representations of the set of all solutions to the systems. The results are further extended to mixed integer systems. Author (GRA)

N73-30571# United Aircraft Corp., East Hartford, Conn.
AN ANALYTICAL METHOD FOR THE SYNTHESIS OF NONLINEAR MULTIVARIABLE FEEDBACK CONTROL Final Report, 10 Apr. 1972 - 30 Apr. 1973
Gerald J. Michael and Florence A. Farrar Jun. 1973 77 p refs
(Contract N00014-72-C-0414; NR Proj. 041-435)
(AD-762797; UARL-M941338-2) Avail: NTIS CSCL 12/1

An analytical synthesis method for the feedback control of nonlinear multivariable systems was developed. The synthesis procedure derived is based on linearizing a system about a set of closely-spaced steady-state operating points and applying linear optimization methods at each point. A single nonlinear control problem is thereby reduced to a series of linear control problems. This permits the use of established analytical and numerical methods associated with linear optimal control theory. At each operating point, an optimal linear feedback controller is generated by minimizing a quadratic performance criterion. Weighting factors within each performance criterion enable the control designer to satisfy performance specifications by trading-off system response against control actuation rates. Nonlinear feedback control is then constructed by combining the series of linear controllers into a single nonlinear controller whose feedback gains vary with system state. (Modified author abstract) GRA

N73-30152 Israel Program for Scientific Translations, Ltd., Jerusalem.

CUBIC SPLINE INTERPOLATION
Yu. S. Zavyalov *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 17-58 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 38, 1970 p 23-73 (For availability see N73-30150 21-08)

N73-30153 Israel Program for Scientific Translations, Ltd., Jerusalem.
BICUBIC SPLINE INTERPOLATION
Yu. S. Zavyalov *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 59-78 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 38, 1970 p 74-101 (For availability see N73-30150 21-08)

N73-30154 Israel Program for Scientific Translations, Ltd., Jerusalem.
SMOOTH CIRCULAR INTERPOLATION OF CURVES
V. A. Leus *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 79-95 Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 38, 1970 p 102-127 (For availability see N73-30150 21-08)

N73-30175 Israel Program for Scientific Translations, Ltd., Jerusalem.
APPROXIMATION OF FUNCTIONS OF THE TERMINAL STATE OF A DYNAMIC SYSTEM. ERROR BOUNDS FOR THE APPROXIMATION AND THEIR APPLICATION TO THE SMALL-PARAMETER METHOD
A. I. Moskalenko *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 295-309 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 40, 1970 p 114-132 (For availability see N73-30150 21-08)

N73-30177 Israel Program for Scientific Translations, Ltd., Jerusalem.
A FORMAL METHOD FOR CONVERTING LOGICAL DESCRIPTIONS OF CRYOTRON AUTOMATA INTO DIFFERENTIAL EQUATIONS
S. M. Achasova *In its* Computer Elem. and Systems (TT-72-50009) 1973 p 321-329 refs Transl. into ENGLISH from Vychislitelnye Sistemy (Novosibirsk), no. 40, 1970 p 149-161 (For availability see N73-30150 21-08)

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N73-30572 National Lending Library for Science and Technology, Boston Spa (England).
A CUP-TYPE SNOW GAUGE
Masayuki Sekine [1973] 10 p refs Transl. into ENGLISH from Weather Service Bull. (Tokyo), v. 39, 1972 p 104-111 (NLL-M-23051-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photo copy coupon

An improvement in snow-collecting rate ease, in maintenance, increase in useful life, and telemetering are considered for snow gage design. A cup shape for the lower part of the funnel is used in order to avoid the diversion of snow by an upward current in the vicinity of the funnel. For preventing evaporation, a kerosene layer is formed on the surface. Author

N73-30573 National Lending Library for Science and Technology, Boston Spa (England).
A ROBOT BUOY
Hideo Akamatsu [1973] 14 p Transl. into ENGLISH from Weather Service Bull. (Tokyo), v. 39, 1972 p 80-87 (NLL-M-23049-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

A robot buoy system which is being operated at Maizuru Marine Observatory was constructed for investigating the relation between marine environment and weather in the vicinity of the polar front over the Sea of Japan. Size, shape, measuring elements, telemeter system, power source of the buoy, and a method for mooring the buoy in deep waters are examined. Author

N73-30574 National Lending Library for Science and Technology, Boston Spa (England).
STATISTICAL CORRELATIONS BETWEEN PRECIPITATION INTENSITIES
A. Madany 1972 9 p Transl. into ENGLISH from Przegl. Geofiz. (Warsaw), v. 17, 1972 p 15-20 (NLL-M-23044-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

From the analysis of 612 rainfalls, recorded at the Warsaw-Okecie pluviograph in 1961-1965, the following conclusions are drawn: (1) The differences between the mean logarithmic maximum intensities and the means both for transient and continuous precipitation are statistically significant, the larger being the mean logarithmic transient precipitation. (2) Also significantly higher are the variances of the logarithms mean and maximum intensities of transient precipitation in comparison with the variances of continuous precipitations. (3) The variances of the logarithms of the maximum intensities are about twice as high as the variances of the mean intensities in groups of continuous precipitation. (4) The maximum and mean intensities of transient and continuous precipitations are strongly correlated, the correlation coefficient for transient precipitation amounting to 0.850 and for continuous precipitation to 0.837. (5) The differences of the coefficients of the linear regression of the logarithms of the mean and maximum intensities between transient and continuous precipitation are statistically not significant. (6) For the assemblage of all precipitations an association exists of statistically significant dependence between few-minute maximum intensities of precipitation and mean intensities. Author

N73-30575 National Lending Library for Science and Technology, Boston Spa (England).
EFFECT OF THE VERTICAL STRUCTURE OF FLOWS UPON THE CLOUDINESS OF THE INTERTROPICAL CONVERGENCE ZONE
S. A. Kac [1973] 13 p refs Transl. into ENGLISH from Glav. Uprav. Gidromet Sluz., Met. Gidr. (Leningrad), no. 5, 1972 p 96-101 (NLL-M-23045-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

An analysis is given of the vertical structure of the intertropical convergence zone divergence field, from the data of 13 meridional sections in the Atlantic amd Indian oceans, as well as its effect on the nature of the cloud cover. It is shown that a vertical two-layer combination of convergence and divergence in the 8-10 km layer leads in 85% of cases to the formation of stable fields of Cb, where as a multilayer combination of the same frequency (85%) leads to their dissolution. Author

N73-30576 National Lending Library for Science and Technology, Boston Spa (England).
CHARACTERISTICS OF THE VARIABILITY OF OBLIQUE AND HORIZONTAL VISIBILITY, FROM EXPERIMENTAL DATA
M. Ja. Racimor [1973] 8 p refs Transl. into ENGLISH from Gidromet. Inst., Proc. (Leningrad), 1971 p 284-289 Presented at the All Union Conf. Problems Met Safety Supersonic Aviat. (Leningrad), 24-26 Mar. 1971 (NLL-M-23046-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon CSCL 04B

The results are presented several hundred simultaneous measurements of oblique and horizontal visibility, and of the cloud base height, as taken every 15 minutes by a group of meteorological observers. The measurements were conducted in the autumn to winter period, for a cloud base of 200 m and lower, and for a horizontal visibility of 3000 m and less. These data indicate that the frequency of small relative changes in horizontal visibility predominates over that of changes in oblique visibility, while large relative changes are preponderant oblique visibility. It is considered significant that for the same values of the parameters, the mean magnitudes of changes in oblique and horizontal visibility agree closely with each other. D.L.G.

N73-30577 National Lending Library for Science and Technology, Boston Spa (England).
A MULTIPARAMETER SCHEME FOR FORECASTING MONTHLY MEAN AIR TEMPERATURE ANOMALIES
M. A. Dujceva and D. A. Ped [1973] 19 p refs Transl. into

ENGLISH from Gidromet. Nauc-Issled. Centr. SSSR T. Vyp. (Leningrad), v. 64, 1970 p 49-68
(NLL-M-23038-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

It is shown that the fields of air temperature anomalies over the European USSR do not remain constant with time. To clarify their variations the time coefficients were computed for the years to 1949 to 1966. Nine values each were determined for every specific month and year. An expansion of the coefficients by natural orthogonal components was made and each component was examined to determine its informativeness. As a results of this analysis a forecasting scheme was constructed which takes into account advective and non-advective factors as they shape the mean monthly air temperature anomaly. Verification of the scheme yielded satisfactory results. D.L.G.

N73-30578 National Lending Library for Science and Technology, Boston Spa (England).
A FORECAST OF THE WEATHER AND AGROMETEOROLOGICAL CONDITIONS FOR WINTER, 21 DECEMBER 1971 - 5 MARCH 1972
N. M. Zaharova and V. A. Moisejcik [1973] 6 p Transl. into ENGLISH from Glav. Uprav. Gidromet. Sluv., Met. Gidr. (Leningrad), 1972 p 125-126
(NLL-M-23035-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

A forecast of the weather and agrometeorological conditions in Russia of the winter of December 1971 through March 1972 is presented. The effect of atmospheric processes in the stratosphere and troposphere and the thermal condition of the Atlantic Ocean on the weather conditions is explained. The expected temperature ranges and snow cover for various areas of Russia are predicted. Author

N73-30579 Purdue Univ., Lafayette, Ind.
THEORETICAL STUDY OF THE THERMAL STRUCTURE AND DISPERSION IN POLLUTED URBAN ATMOSPHERES Ph.D. Thesis
Robert William Bergstrom 1972 209 p
Avail: Univ. Microfilms Order No. 73-5988

The influence of air pollution on the urban and global climate has often been speculated, but definitive conclusions cannot be made because of the lack of data and understanding. In an attempt to gain some of the needed insight into the problem, a mathematical model for the atmospheric radiation transfer and the one-dimensional mass, momentum, and energy transport in the planetary boundary layer was constructed. The atmosphere consisting of gaseous and particulate pollutants as well as natural constituents was considered to absorb, emit and scatter anisotropically radiant energy. A series of numerical simulations of the thermal structure and pollutant dispersion in the urban atmosphere was performed for summer and winter conditions, with and without an elevated inversion. The modification of the temperature and concentration distributions by the radiatively participating pollutants was investigated. Dissert. Abstr.

N73-30580# Israel Program for Scientific Translations, Ltd., Jerusalem.
RADAR METEOROLOGY
V. V. Kostarev, ed., A. A. Chernikov, ed., and A. B. Shupyatskii, ed. 1971 282 p refs Transl. into ENGLISH of "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdata., 1968 Proc. of the 3d All-Union Conf., Moscow, Apr. 1965 Prepared for NOAA and NSF
(TT-70-50120; SBN-7065-1091-7; IPST-5809) Avail: NTIS HC $16.25

The proceedings of a conference on the application of radar imagery for obtaining meteorological data are presented. The subjects discussed are: (1) radar precipitation measurements, (2) detection and monitoring of hail centers, (3) radar studies of clouds, (4) absorption and emission of radio waves in clouds and precipitation, (5) radar studies of wind and turbulence, (6) radar estimates of cloud modification effects, (7) radar information applied to weather forecasting, and (8) equipment and procedure for radar observations of meteorological objects. For individual titles, see N73-30581 through N73-30611.

N73-30581 Israel Program for Scientific Translations, Ltd., Jerusalem.
RESULTS OF RADAR PRECIPITATION MEASUREMENTS IN THE VALDAI AREA
L. I. Beznis, G. P. Beryulev, A. M. Borovikov, V. V. Kostarev, I. P. Mazin, I. G. Potemkin, V. I. Smirnov, A. A. Chernikov, and B. Sh. Shapiro *In its* Radar Meteorol. (TT-70-50120) 1971 p p 1-12 Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

The accuracy of radar measurements of precipitation is discussed. The equipment and technique for conducting the measurements are described. Comparisons of radar and ground level observations were made to determine areas of discrepancy. A mathematical model is developed to show the precipitation density according to the radar data. Results of the comparisons are presented in graph and tabular form. Author

N73-30582 Israel Program for Scientific Translations, Ltd., Jerusalem.
BASIC RESULTS OF RADAR PRECIPITATION MEASUREMENTS ON AN EXPERIMENTAL SHOWER-MEASUREMENT SECTION, 1964 AND 1965
L. M. Volynets, M. L. Markovich, and V. M. Muchnik *In its* Radar Meteorol. (TT-70-50120) 1971 p 12-20 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

Radar precipitation measurements and rain gage measurements were conducted to provide a basis for determining the accuracy of the radar measurements. The distribution of the instruments used in the project is described. The numerical relationships to show the relationship between reflectivity and rainfall intensity are developed. Tables of data are presented to show the relative errors of radar precipitation measurements for individual rainfalls. Author

N73-30583 Israel Program for Scientific Translations, Ltd., Jerusalem.
THE RADAR EQUATION AND RADAR CALIBRATION FOR MEASURING MULTIPLE-TARGET REFLECTIVITY c07
G. P. Beryulev, V. V. Kostarev, I. G. Potemkin, and A. A. Chernikov *In its* Radar Meteorol. (TT-70-50120) 1971 p 21-26 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

The errors which occur in radar measurements of precipitation are discussed. It was determined that careful calibration of the radar and accurate determination of the coefficients in the radar equation should bring the differences between the calculated and measured radar echo powers within the limits of measurement error. The radar equation is developed to show the relationships of the various parameters of radar measurement. A mathematical method is developed for determining the radar coefficients. Author

N73-30584 Israel Program for Scientific Translations, Ltd., Jerusalem.
RESULTS OF JOINT RADAR AND GROUND-LEVEL MEASUREMENTS OF PRECIPITATION MICROSTRUCTURE
A. G. Gorelik, I. V. Gritskiv, L. A. Penyaz, and V. V. Tsykunov *In its* Radar Meteorol. (TT-70-50120) 1971 p 26-31 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

Some synchronous observations of precipitation microstructure using radar and ground-level instruments were carried out. The goals of the experiment were: (1) to obtain simultaneous, comparable data on the drop distribution in the size range determining the radar reflectivity of precipitation; (2) to determine coefficients A and a in the equation relating the radar reflectivity Z to the precipitation intensity on the basis Of ground-level and radar measurements; and (3) to compare the precipitation measured at an observation point on the ground, using pluviographs and filter papers, with the precipitation passing through a specific volume at some distance above the ground. The

high-level precipitation measurements were made by a pulsecoherent radar station operating in a vertical-sounding regime. Author

N73-30585 Israel Program for Scientific Translations, Ltd., Jerusalem.
MULTIWAVELENGTH RADAR MEASUREMENTS OF PRECIPITATION INTENSITY
G. K. Sulakvelidze and Yu. A. Dadali *In its* Radar Meteorol. (TT-70-50120) 1971 p 32-45 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

Several radar methods exist for measuring the precipitation intensity and two of the methods are discussed. One method is based on measurement of radar reflectivity and a correlation equation to show the relationship of the parameters is developed. The second method is based on the measurement of the attenuation of microwaves in the precipitation band using a standard radar target. The method of standard targets has an advantage over the the first method since it makes use of both the radar reflectivity and the microwave attenuation factor. This makes it possible to carry out an approximate evaluation of the concentration and effective dimensions of the raindrops, and thus in turn to obtain a more specific determination of the precipitation intensity. Author

N73-30586 Israel Program for Scientific Translations, Ltd., Jerusalem.
VGI STUDIES OF HAIL-CENTER DETECTION
G. K. Sulakvelidze *In its* Radar Meteorol. (TT-70-50120) 1971 p 46-53 Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

Certain characteristic signs of hail-bearing clouds have been determined as a result of radar studies (in these studies a hail-bearing cloud is a cloud producing hail which reaches the earth's surface). These characteristic signs include: (1) the height of the radio echo, (2) the area of the radio-echo cross section, (3) the radio-echo configuration on the PPI scope, (4) the variation with height of the maximum reflectivity from a cloud, and (5) the ratio of the warm part of the radio echo to the cold part. Certain characteristic signs can be selected which together provide an unambiguous indication of a hail-bearing cloud. However, a comparison of these signs for different regions indicates that they depend on the geographical conditions, and also that they vary from season to season for a given place. Author

N73-30587 Israel Program for Scientific Translations, Ltd., Jerusalem.
RESULTS OF RADAR STUDIES OF TIME VARIABILITY OF CUMULONIMBUS CLOUDS IN SHOWER AND THUNDERSTORM STAGES
S. B. Gashina and E. M. Salman *In its* Radar Meteorol. (TT-70-50120) 1971 p 54-59 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi, Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

Radar studies of the time variability of cumulonimbus clouds in shower and thunderstorm stages were conducted. The following radio echo characteristics were analyzed: (1) maximum height of cloud, (2) height corresponding to maximum reflectivity, (3) absolute value of maximum reflectivity, (4) absolute value of reflectivity averaged over height, and (5) absolute value of reflectivity at different heights. Conclusions concerning the properties of the clouds based on the analysis of radar data are submitted. Author

N73-30588 Israel Program for Scientific Translations, Ltd., Jerusalem.
POLARIZATION STUDIES OF CUMULONIMBUS STRUCTURE
V. E. Minervin, S. P. Morgunov, and A. B. Shupyatskii *In its* Radar Meteorol. (TT-70-50120) 1971 p 59-68 Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

The application of polarized radar signals to the study of cumulonimbus clouds is discussed. In general the secondary wave should be polarized. Joint measurements with radar and airborne instruments were carried out in order to compare the polarization characteristics of the echo signal with the passes of the cloud and precipitation particles. Results of the observations of particle shapes from aircraft were compared with the measured depolarization of the echo signal. On the basis of individual comparisons, a nomogram relating the probability of a given echo signal depolarization to the phase of the article causing the signals and the particle shape was plotted. Author

N73-30589 Israel Program for Scientific Translations, Ltd., Jerusalem.
RADIO-WAVE SCATTERING IN CLOUDS AND THE RADAR EQUATION c07
A. A. Chernikov *In its* Radar Meteorol. (TT-70-50120) 1971 p 68-73 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

The application of radio wave propagation and radar signatures for research of cloud formations are discussed. A determination of the scattering diagram for radio waves in clouds makes it possible to obtain information on the form of the correlation function for the water content of a cloud. Mathematical models are provided to show the relationships of the radar and cloud parameters. Author

N73-30590 Israel Program for Scientific Translations, Ltd., Jerusalem.
RESULTS OF RADAR DIRECTION-FINDING OBSERVATIONS OF SHOWERS AND THUNDERSTORMS USING MRL-1 RADAR WITH STORM DIRECTION FINDER c07
S. M. Galperin, V. D. Stepanenko, M. E. Solomonik, G. F. Shevela, N. V. Baru, and F. I. Burdakov *In its* Radar Meteorol. (TT-70-50120) 1971 p 73-80 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdata., 1968 (For availability see N73-30580 21-20)

The use of radar direction finding observations to determine the extent and severity of rain showers and thunderstorms is discussed. A number of basic criteria or methods for the radar evaluation of storm activity are presented. The equipment and procedures for analyzing the thunderstorm activity with direction finding equipment are explained. The introduction of direct methods for determining the electrical states of meteorological centers, using a direction finder, widens the range of application of indirect methods for evaluating radio echoes. Author

N73-30591 Israel Program for Scientific Translations, Ltd., Jerusalem.
RADAR MEASUREMENTS OF MICROSTRUCTURE CHARACTERISTICS OF CLOUDS
M. T. Abshaev *In its* Radar Meteorol. (TT-70-50120) 1971 p 80-97 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya fo Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

Remote methods for determining the microstructure parameters of cumulonimbus clouds (size, concentration, spectrum of large cloud particles, and water contents of cumulonimbus clouds composed of large particles) are discussed. Present-day radar techniques make it possible to obtain considerable information on atmospheric formations. In particular, radar is used to measure the intensity of the backscattered energy, the microwave attenuation factor, the Doppler frequency of the field scattered by moving particles, the polarization characteristics, and the coherent and incoherent components of the scattered-field intensity. Author

N73-30592 Israel Program for Scientific Translations, Ltd., Jerusalem.
EXPERIMENTAL STUDY OF POLARIZATION PROPERTIES OF METEOROLOGICAL TARGETS
N. F. Pavlov and V. D. Stepanenko *In its* Radar Meteorol. (TT-70-50120) 1971 p 97-105 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

The possibility of using the polarization parameters of echo signals as carriers of information on reflecting atmospheric formations is associated with the depolarization of electromagnetic waves which occurs at reflection was investigated. The depolarization is in turn a result of the nonspherical shape of the particles making up clouds and precipitation, and its nature will be determined by the shape factor of the particles and by their orientation in space. The experimental study of echo-signal depolarization by meteorological targets has been considered. The average values of the fundamental and depolarization components of the signal were analyzed. This was done because theoretical considerations indicated a single-valued relationship between the presence of the depolarization component and its magnitude, and the shape and orientation of the particles in the atmospheric formations. Author

N73-30593 Israel Program for Scientific Translations, Ltd., Jerusalem.

RADIO EMISSION AND ABSORPTION OF CLOUDY ATMOSPHERE IN mm AND cm RANGES c07

A. E. Basharinov and B. G. Kutuza *In its* Radar Meteorol. (TT-70-50120) 1971 p 106-118 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveschaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

The application of radio astronomical methods which were developed for studying the free atmosphere and proposed for the study of hydrometeors. Radio astronomical methods are employed to study the relationship between the microwave absorption spectrum and the properties of atmospheric cloud formations. The relations describing the radio transparency and emissive power of a cloudy atmosphere in the superhigh frequency range are considered. The radio brightness temperature of the self-radiation of the atmosphere is defined for conditions of local thermodynamic equilibrium. Author

N73-30594 Israel Program for Scientific Translations, Ltd., Jerusalem.

EXPERIMENTAL STUDIES OF ATTENUATION AND RADIO EMISSION OF RAIN IN THE SHF RANGE c07

B. G. Kutuza *In its* Radar Meteorol. (TT-70-50120) 1971 p p 118-126 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

The study of the attenuation and radio emission of rain was made using radio-astronomical methods. The procedure for radiometric measurements using the RT-22 radio telescope is described. The observations of the radio emission and attenuation of rain were carried out during September 1964 and June 1965. In the first case, the falling of rain for each set of observations was associated with the passage of frontal cloudiness. In June 1965 the precipitation came from cumulonimbus clouds. The rain intensity varied from 0.5 to 65 mm/hr. Four sets of observations were made in September and eight in June. Each set of observations lasted for one or two hours. The self-radiation of the atmosphere was picked up with a stationary antenna for wavelengths of 0.82, 1.6, and 3.3 cm. Wavelengths of 0.41, 0.82, and 1.6 cm were used in the observations of solar radio emission. The rain intensity was recorded at the same time as the radiometric observations. Author

N73-30595 Israel Program for Scientific Translations, Ltd., Jerusalem.

ATTENUATION OF PRECIPITATION REFLECTIONS IN RADARS WITH LINEAR POLARIZATION c07

N. F. Pavlov *In its* Radar Meteorol. (TT-70-50120) 1971 p p 126-131 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

The use of radio waves with circular polarization is recommended to reduce the interfering effect of hydrometeors is discussed. However, in some cases circular polarization is inconvenient for various reasons. Consequently, there are a large number of radar sets with linear polarization being used at present, and these are completely unprotected from the disturbing effects of hydrometeors. The passage through a radar waveguide of a circularly polarized wave reflected from spherical drops was analyzed. This analysis indicated that the attenuation of reflections from precipitation is due not to the use of circularly polarized waves but rather to the polarization properties of the meteorological target and to the reciprocal polarization properties of a radar antenna with circular polarization. Consequently, it is evident that circularly polarized waves need not be used to attenuate echo signals from hydrometeors. Author

N73-30596 Israel Program for Scientific Translations, Ltd., Jerusalem.

STRUCTURE OF HORIZONTAL WIND FLUCTUATIONS IN PRECIPITATION ACCORDING TO RADAR DATA

Yu. V. Melnichuk *In its* Radar Meteorol. (TT-70-50120) 1971 p 132-142 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

Radar measurements of the characteristics of atmospheric turbulence are carried out by measuring the velocities of reflectors located in the scattering volume of the radar set. If the reflectors are moved considerably by an air current, then their velocity of motion indicates the wind velocity, provided the measurements are made with horizontal sounding or at small elevation angles. The reflectors may be cloud or precipitation particles, or even artificial scatterers introduced into the atmosphere by some means or other. When such objects are sounded using a Doppler radar, the spectrum of radar-signal fluctuations from some elementary volume (called the scattering volume) will have the same shape as the distribution of radial projections of the velocities of the scatters in this volume. The size and shape of the scattering volume depend on the radar parameters. If the directional diagram of the antenna is axially symmetric, then this volume is equivalent to a cylinder with a generatrix parallel to the sounding direction. Author

N73-30597 Israel Program for Scientific Translations, Ltd., Jerusalem.

RADAR STUDY OF TURBULENT-FLOW STRUCTURE IN EARTH-ADJACENT LAYER FOR SUBFRONTAL CLOUDS AND PRECIPITATION

A. G. Gorelik and V. A. Patsaeva *In its* Radar Meteorol. (TT-70-50120) 1971 p 142-150 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

The application of radar for analyzing the turbulent flow structure in earth adjacent layers for subfrontal clouds and precipitation is discussed. A pulse coherent radar with narrow directional diagram was used during snowfalls for precipitation measurements. The radar was equipped to provide continuous measurement of the Doppler frequency shift, intensity, and spectrum of the reflected signal at two heights simultaneously. The meteorological conditions existing during the measurement of the wind characteristics are described. Tables of data are provided to show the ratios between the fluctuations of longitudinal, transverse, and vertical flow velocity components in the earth adjacent layers. Author

N73-30598 Israel Program for Scientific Translations, Ltd., Jerusalem.

A NEW METHOD FOR MEASURING DISSIPATION RATE OF TURBULENCE IN CLOUDS AND PRECIPITATION USING CONVENTIONAL RADAR

A. G. Gorelik and Yu. V. Melnichuk *In its* Radar Meteorol. (TT-70-50120) 1971 p 150-156 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

Radar measurements of the parameters of atmospheric turbulence are based on the relation between two quantities: 1) the fluctuation spectrum of the envelope of the radar signal from a given scattering volume, filled with scatterers carried along by the wind; and 2) the motion of these scatterers. Either artificial reflectors (dipoles) introduced into the atmosphere or cloud and precipitation particles can serve as the scatterers. One of the turbulence parameters which can be determined using

radar is the dissipation rate of turbulent energy. This quantity can be measured in two basic ways. Author

N73-30599 Israel Program for Scientific Translations, Ltd., Jerusalem.
POLARIZATION CHARACTERISTICS OF ECHO SIGNALS FROM A CLEAR SKY c07
A. A. Chernikov and A. B. Shupyatskii *In its* Radar Meteorol. (TT-70-50120) 1971 p 157-163 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

Radar reflections from invisible objects in the troposphere, which are known as angels, have been studied. In these studies such characteristics of the reflected signals as radio-echo power, amplitude fluctuation, Doppler shift of frequency, backscattering diagram, and frequency dependence of effective target area were considered. Comparisons between radar data and the results of various aerological and meteorological measurements have given a strong indication that the sources of the reflections are dielectric inhomogeneities of the air. At the same time, other hypotheses exist concerning the nature of the sources of these reflections. In the earlier studies the polarization of the radar signals, which is a very important characteristic, was not considered. It is demonstrated that a determination of the polarization properties of reflections from a clear sky constitutes a significant step toward explaining such echoes. Author

N73-30600 Israel Program for Scientific Translations, Ltd., Jerusalem.
BACKSCATTERING DIAGRAMS FOR SOURCES OF REFLECTIONS FROM A CLEAR SKY c07
A. A. Chernikov *In its* Radar Meteorol. (TT-70-50120) 1971 p 164-168 ref Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

The study of backscattering diagrams for sources of reflections from a clear sky constitute an important step toward determining the physical nature of these sources, since the spatial distribution of the scattered field depends, to a considerable degree, on the size and shape of the target. The scattering diagrams of such reflection sources have been studied. These studies showed the backscattering diagram to be quite narrow (0.8 to 2.5). Later, however, a detailed analysis of the experimental equipment and procedure indicated that this result might have been due to differences between the antennas used for the measurements. Therefore, the experiment was repeated, after the equipment and procedure had been modified so as to eliminate the errors which appeared in the first measurements. Author

N73-30601 Israel Program for Scientific Translations, Ltd., Jerusalem.
MEASURING SOURCE VELOCITIES FOR REFLECTIONS FROM A CLEAR SKY c07
A. G. Gorelik and A. A. Chernikov *In its* Radar Meteorol. (TT-70-50120) 1971 p 168-175 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

Data on the motion of sources of reflections from a clear sky are an important key to understanding the physical nature of these phenomena. The velocities of motion of such targets have been measured. Data on the target coordinates were used to determine the velocities of the reflection sources, while the velocities were found with pulsed Doppler radars. These studies indicated that the echo sources move predominantly with the wind, but that sometimes there are appreciable deviations in both speed and direction. Vertical target velocities usually lie within an interval of plus or minus 2 m/sec, and they very seldom go beyond the limits of the indicated values. Author

N73-30602 Israel Program for Scientific Translations, Ltd., Jerusalem.
METEOROLOGICAL NATURE AND CHARACTERISTICS OF ANOMALOUS RADIO ECHOES c07
G. B. Brylev and A. A. Fedorov *In its* Radar Meteorol. (TT-70-50120) 1971 p 175-184 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

The meteorological nature and characteristics of anomalous radio echoes are discussed. Comparisons between joint aerological and radar data provide information concerning the effect which convective-turbulent motions in the atmosphere have on the character and type of radar reflections from a clear sky. Such signals have been received during vertical sounding of the troposphere. When the vertical distribution of the average radar signals is compared with aerological data, zones of increased radar reflectivity are found to correspond to certain features of the height distribution of meteorological elements. Author

N73-30603 Israel Program for Scientific Translations, Ltd., Jerusalem.
RADAR STUDIES OF INDUCED-PRECIPITATION BELTS
V. N. Podgurskaya and I. P. Polovina *In its* Radar Meteorol. (TT-70-50120) 1971 p 185-192 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

The analysis of radar data to determine the characteristics of precipitation resulting from weather modification practices is presented. Radar tracking was conducted while clouds were seeded from an airplane. Photographic recording of the radar returns was made and the width of the precipitation zones and the areas of precipitation were determined. Preliminary analysis indicated that the precipitation belts are nonuniform especially when high wind velocities occur. Author

N73-30604 Israel Program for Scientific Translations, Ltd., Jerusalem.
APPLICATION OF RADAR DATA TO SYNOPTIC ANALYSIS c07
B. Sh. Divinskaya *In its* Radar Meteorol. (TT-70-50120) 1971 p 193-202 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

The development and application of meteorological radar for detecting zones of cloudiness, precipitation, and storms are discussed. The uses of radar data for synoptic weather analysis and forecasting are explained. A system for classifying the weather radar data is reported. Examples of radar meteorological data processing are included. Author

N73-30605 Israel Program for Scientific Translations, Ltd., Jerusalem.
ACQUISITION OF RADAR METEOROLOGICAL INFORMATION ON CLOUDS, CLOUD SYSTEMS, AND DANGEROUS PHENOMENA c07
E. M. Salman, V. A. Petrushevskii, S. I. Vaksenburg, and G. F. Shevela *In its* Radar Meteorol. (TT-70-50120) 1971 p 203-219 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

Radar meteorological information can be utilized effectively only if detection of the object is guaranteed, a relationship between the radar characteristics and the physical features of the object is established, and equipment for efficient processing of the data is available. The development of a means of ensuring the quick acquisition of a sufficiently extensive complex of information concerning such meteorological objects as clouds, cloud systems, and dangerous phenomena associated with them deserves special attention. Information of importance to meeting various practical needs, and also for the analysis and forecasting of weather is discussed. Author

N73-30606 Israel Program for Scientific Translations, Ltd., Jerusalem.
EQUIPMENT COMPLEX FOR AUTOMATIC ACQUISITION AND PROCESSING OF RADAR METEOROLOGICAL DATA c08
V. A. Petrushevskii, S. M. Persin, G. F. Shevela, E. M. Salman, and S. I. Vaksenburg *In its* Radar Meteorol. (TT-70-50120) 1971 p 219-234 refs Transl. into ENGLISH from "Trudy

Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

Methods for acquiring radar meteorological data are discussed to show the problems involved. The development of equipment to solve these problems is described. The use of a digital computer for data processing is recommended. The measurement of spatial and amplitude characteristics of radio echoes is reported. Mathematical models are included to show the relationships of the various meteorological parameters measured by the radar system to complete the reporting service. Author

N73-30607 Israel Program for Scientific Translations, Ltd., Jerusalem.
METHODS FOR RAISING POTENTIALS OF mm-BAND METEOROLOGICAL RADARS c07
G. F. Shevela and S. I. Vaksenburg *In its* Radar Meteorol. (TT-70-50120) 1971 p 234-239 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

The characteristics of meteorological radar operating in the millimeter wavelength range are described. The limitations of the radar due to atmospheric attenuation are explained. Techniques for improving the capability of millimeter range radars are analyzed. Among the suggestions for performance improvement are: (1) increasing transmitter power, (2) increasing receiver sensitivity, and (3) modifications to waveguides to reduce losses and increase electric strength. Author

N73-30608 Israel Program for Scientific Translations, Ltd., Jerusalem.
RECEIVING DEVICE FOR AUTOMATIC CONVERSION OF RADAR METEOROLOGICAL SIGNALS c07
N. V. Gornostaev and G. M. Efimov *In its* Radar Meteorol. (TT-70-50120) 1971 p 239-249 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

Automation of the acquisition, processing, and distribution of radar meteorological information on cloud fields and dangerous phenomena associated with them are discussed. An automated radar system must include special devices which open up new possibilities for obtaining primary radar data. One of the most important of these is the radar receiving device, which in the given case must satisfy a number of special requirements. These requirements will be determined by the specific properties of the radar characteristics of the atmospheric formations studied. In addition, they will depend on the required accuracy and efficiency of converting the radar meteorological signals to a form convenient for their subsequent processing by a computer used in conjunction with the radar. Author

N73-30609 Israel Program for Scientific Translations, Ltd., Jerusalem.
A METHOD FOR MEASURING RADIO-ECHO INTENSITIES WITH METEOROLOGICAL RADARS c07
F. I. Burdakov, I. M. Zavelevich, and P. N. Nikolaev *In its* Radar Meteorol. (TT-70-50120) 1971 p 249-255 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

A method for measuring the radio echo intensities of atmospheric formations is discussed. Mathematical models are developed to establish the relationships between radar signatures and meteorological parameters. The requirements of a system for quantitative evaluation of the radio echo intensity are analyzed. A block diagram of a circuit for use with a meteorological radar is developed. Examples of the plan position indicator data are included. Author

N73-30610 Israel Program for Scientific Translations, Ltd., Jerusalem.
A METHOD FOR REDUCING THE BLIND ZONE OF A METEOROLOGICAL RADAR c07
S. I. Vaksenburg, N. V. Gornostaev, V. I. Gurevich, and G. F. Shevela *In its* Radar Meteorol. (TT-70-50120) 1971 p 255-262 refs Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

Certain points related to determinations of lower cloud boundaries with the aid of a dual-range meteorological radar operating in the vertical-sounding mode are discussed. With vertical scanning of the radar beam it is possible to determine cloud boundaries at some distance from the radar set. This is because of the high resolution of the radar with respect to elevation angle on a millimeter channel. There are certain limitations to determining cloud heights using the vertical-sounding mode. These are connected with the minimum range of action of the radar, which for normal receiver sensitivity is governed not only by the length of the sounding pulse but also, to a considerable extent, by the effect of long-range side lobes of the antenna, that is, by the intensity of secondary radiation in directions close to 90 deg away from the major maximum of the diagram. The amount (range) of illumination of the scopes due to the effect of the antenna side lobes is determined by more than just the intensity of the side lobes themselves. It will also depend on the location of the meteorological radar (topography of surrounding area, buildings and other structural), and on the angle of elevation of the antenna. Author

N73-30611 Israel Program for Scientific Translations, Ltd., Jerusalem.
MULTIWAVELENGTH RADARS FOR MICROSTRUCTURE STUDIES OF CLOUDS AND PRECIPITATION c07
B. Kh. Tkhamokov *In its* Radar Meteorol. (TT-70-50120) 1971 p 263-277 Transl. into ENGLISH from "Trudy Tretego Vsesoyuznogo Soveshchaniya po Radiolokatsionnoi Meteorologii" Moscow, Gidrometeoizdat., 1968 (For availability see N73-30580 21-20)

Studies of the artificial modification of hail processes were carried out. In addition, radar techniques for detecting hail-bearing clouds were worked out, together with methods for monitoring the results of the modification. In such studies, it is first necessary to determine the complex of radar characteristics of the cloud: (1) vertical power of radio echo, (2) radar reflectivity of clouds and precipitation, and (3) coordinates. In addition, it is important to find the diameter and concentration of hailstones in the cloud, using the radar. The above requirements will determine the design and construction of the radar set used in the studies. Author

N73-30612# Joint Publications Research Service, Arlington, Va.
METEOROLOGY AND HYDROLOGY, NO. 5, MAY 1973
23 Jul. 1973 122 p refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 85 p
(JPRS-59580) Avail: NTIS HC $8.25

Articles are presented on microclimate, agricultural meteorology, weather forecasting and climate control, hydrological forecasting, the activities and personnel of the Soviet Hydrometeorological Service, and new publications. For individual titles, see N73-30613 through N73-30623.

N73-30613 Joint Publications Research Service, Arlington, Va.
CALCULATING THE MEAN MONTHLY VALUES OF THE HEAT AND MOISTURE FLUXES OVER THE OCEANS
N. Z. Ariyel, R. S. Bortkovskiy, E. K. Byutner, N. V. Kucherov, and L. A. Strokina *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-595-80) 23 Jul. 1973 p 1-11 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 3-11 (For availability see N73-30612 21-20)

A porcedure is proposed for calculating the mean monthly magnitudes of turbulent fluxes by the data on mean values of meteorological elements above the ocean. Author

N73-30614 Joint Publications Research Service, Arlington, Va.
LARGE-SCALE FLUCTUATIONS OF THE WATER SURFACE TEMPERATURE IN THE NORTH ATLANTIC c13
A. I. Ugryumov *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-59580) 23 Jul. 1973 p 12-25 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 12-22 (For availability see N73-30612 21-20)

On the basis of analyzing the data of nine weather ships in the Atlantic Ocean, integral characteristics were proposed for the water surface temperature anomaly field. A statistical analysis was made of these characteristics, and some conclusions were

drawn with respect to the mechanism of formation of large-scale thermal anomalies in the ocean. Author

N73-30615 Joint Publications Research Service, Arlington, Va.
EFFECT OF THE FLUCTUATIONS OF THE CARBON DIOXIDE CONCENTRATION ON THE THERMAL REGIME OF THE ATMOSPHERE **c13**
L. R. Rakipova and O. N. Vishnyakova *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-59580) 23 Jul. 1973 p 26-36 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 23-31 (For availability see N73-30612 21-20)

The problem of the effect of the Co2 concentration variations on the temperature of a clear sky was investigated for the stationary zonal schematic of the thermal regime of the atmosphere in which the following are considered: the radiation heat fluxes, the macroturbulent heat exchange (horizontal and vertical), the heat of condensation and vaporization, the heat exchange between the surface of the ocean and the lower lying layers. The Co2 concentration varied from zero to a value five times exceeding the modern volumetric concentration. The warming effect of the C02 under modern conditions is 6.7 K for the warm hemisphere and 6.9 K for the cold hemisphere. The increase in C02 concentration by 20% with respect to Sub 0 corresponds to delta T = 0.3 K, and an increase by 100% to delta T is approximately equal 1.3 K. For large C02 concentrations, the saturation effect arises. Author

N73-30616 Joint Publications Research Service, Arlington, Va.
MATCHING THE GEOPOTENTIAL AND WIND FIELDS IN ORDER TO IMPROVE THE ACCURACY OF OBJECTIVE ANALYSIS
V. V. Kostyukov *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-59580) 23 Jul. 1973 p 37-46 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 32-39 (For availability see N73-30612 21-20)

A method is described for matching the meteorological fields based on successive integration of the equations of adaptation and quasistationary adaptation of the wind fields to the geopotential field. Results are presented from numerical experiments performed on real data which indicate that the method can be effective for improving the quality of an objective analysis of the geopotential and the wind in regions poorly covered by observation data. Author

N73-30617 Joint Publications Research Service, Arlington, Va.
ZONAL WIND FIELD STRUCTURE IN THE STRATOSPHERE AND LOWER MESOSPHERE OF THE TROPICAL ZONE DURING THE EQUINOXES **c13**
L. S. Minyushina *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-59580) 23 Jul. 1973 p 47-58 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 40-49 (For availability see N73-30612 21-20)

The spatial sections of the zonal wind component constructed by the data of four atmospheric rocket sounding stations are presented. The structure of the wind field in the tropical zone is analyzed for the equinox periods of 1965 to 1968. Author

N73-30618 Joint Publications Research Service, Arlington, Va.
SORTING ANALOGS TO COMPOSITE-KINEMATIC MAPS OF NATURAL SYNOPTICS PERIODS **c08**
O. V. Batyreva and I. I. Orlova *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-59580) 23 Jul. 1973 p 59-68 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 50-57 (For availability see N73-30612 21-20)

In sorting the analogs to the composite-kinematic maps of the natural synoptic periods, four parameters are proposed which take into account the similarity of the fields with respect to sign and direction of displacement of the baric formations. On the basis of the results of the visual sorting of the analogs, the threshold values of the parameters are determined by the Bayes method which separate the situations analogous to the given one. The results of estimating the sort of the analogs on dependent and independent material are presented. Author

N73-30619 Joint Publications Research Service, Arlington, Va.
METHOD OF CALCULATING THE CORRELATION FUNCTIONS OF THE DIURNAL PRECIPITATION TOTALS AND THEIR SPACE-TIME VARIABILITY UNDER VARIOUS NATURAL CONDITIONS
A. A. Dmitriyev and A. A. Isayev *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-59580) 23 Jul. 1973 p 69-77 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 58-65 (For availability see N73-30612 21-20)

A procedure is proposed for calculating the correlation functions of the diurnal precipitation totals for territory which is more or less uniform with respect to relief on the basis of the standard station observations and the results of the dependence of the precipitation correlation on the distance and duration of the precipitation (according to the data for the Obninsk test site). A study was made of the spatial and time variability of the correlation functions. The duration of the observation period required to obtain the normal correlation function is investigated. Author

N73-30620 Joint Publications Research Service, Arlington, Va.
ICE JAMS ON THE DNESTR AND SOME PROPOSALS TO PREVENT FLOODING CAUSED BY THEM **c13**
V. N. Karnovich and V. I. Sinotin *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-59580) 23 Jul. 1973 p 78-87 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 78-85 (For availability see N73-30612 21-20)
Avail: NTIS

Some information about ice jams and the characteristic features of the ice jam process in the Dnestr and the Dubossary Reservoir are discussed. Procedures are recommended for improving the efficiency of applying explosives and regulating the water level of the headrace of the Dubossary Hydroelectric Power Plant to control the jams. A study was made of the possible effect of the planned Mogilev-Podol'skiy Hydroelectric Power Plant on changing the ice conditions of the Dnestr. It is proposed that a number of permanent engineering structures be erected in defined sections of the Dnestr to hold back the ice and discharge the water into bypasses around the jams in order to prevent disastrous floods. Author

N73-30621 Joint Publications Research Service, Arlington, Va.
WIND-WAVE SPECTRUM AT THE EDGE OF THE ICE **c13**
G. K. Zubakin *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-59580) 23 Jul. 1973 P p 88-92 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 95-97 (For availability see N73-30612 21-20)

On the basis of the spectral representation of the structure of wind driven waves, a study was made of the experimental results in the vicinity of the edge of the ice. The contribution of the long wave components arriving from the rarified ice to the total wave energy in the open water was discovered. A procedure was proposed for calculating the wave height in the vicinity of the edge of the ice in situations analogous to the experiment performed. Author

N73-30622 Joint Publications Research Service, Arlington, Va.
LOW-LEVEL JET STREAMS IN THE BOUNDARY LAYER OF THE ATMOSPHERE **c13**
N. I. Novozhilov *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-59580) 23 Jul. 1973 p 93-102 refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 105-110 (For availability see N73-30612 21-20)

A brief history of observations of mesojets is presented. Basic information on the relation of the mesojets to dangerous weather phenomena is included. Author

N73-30623 Joint Publications Research Service, Arlington, Va.
SYMPOSIUM ON THE PROBLEMS OF STUDYING THE STATISTICAL STRUCTURE, THE OBJECTIVE ANALYSIS AND AUTOMATED MONITORING OF METEOROLOGICAL FIELDS
L. S. Gandin and R. L. Kagan *In its* Meteorology and Hydrol., No. 5, May 1973 (JPRS-59580) 23 Jul. 1973 p 112-119 ref Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 5, 1973 p 120-124 (For availability see N73-30612 21-20)

Symposium papers on the statistical structure of meteorological fields and methods of automated monitoring and correction of meteorological observation data are discussed. Objective analyses of such data are reviewed. Author

N73-30624# Finnish Meteorological Inst., Helsinki.
PRECIPITATION AND SNOW COVER DATA, 1970 (METEOROLOGICAL YEARBOOK OF FINLAND, VOLUME 70, PART 2)
1972 117 p refs In ENGLISH and FINNISH
(ISBN-951-697-010-9) Avail: NTIS HC $8.00

Daily precipitation recordings and reports on the nature of the precipitation from 108 stations are included. The tabulated data include monthly and annual precipitation, maximum diurnal precipitation, the date of the latter, the number of days with rain excess of 0.1, 1.0 and 10.0 mm and the number of days with snow or alert in excess of 0.1 mm. Author

N73-30625*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NORMAL PROBABILITIES FOR CAPE KENNEDY WIND COMPONENTS: MONTHLY REFERENCE PERIODS FOR ALL FLIGHT AZIMUTHS. ALTITUDES 0 TO 70 KILOMETERS
L. W. Falls 16 Apr. 1973 172 p
(NASA-TM-X-64771) Avail: NTIS HC $10.75 CSCL 04B

This document replaces Cape Kennedy empirical wind component statistics which are presently being used for aerospace engineering applications that require component wind probabilities for various flight azimuths and selected altitudes. The normal (Gaussian) distribution is presented as an adequate statistical model to represent component winds at Cape Kennedy. Head-, tail-, and crosswind components are tabulated for all flight azimuths for altitudes from 0 to 70 km by monthly reference periods. Wind components are given for 11 selected percentiles ranging from 0.135 percent to 99.865 percent for each month. Results of statistical goodness-of-fit tests are presented to verify the use of the Gaussian distribution as an adequate model to represent component winds at Cape Kennedy, Florida. Author

N73-30626# Bureau of Meteorology, Melbourne (Australia).
MONTHLY CLIMATE DATA, SURFACE, AUSTRALIA, AUGUST 1972
Aug. 1972 69 p
Avail: NTIS HC $5.50

Surface climatological statistics most likely to meet the need of commerce, education, primary and secondary industry, research and other fields are tabulated. Author

N73-30627*# Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
A COMPARISON OF A COAXIAL FOCUSED LASER DOPPLER SYSTEM IN ATMOSPHERIC MEASUREMENTS Final Report
S. Karaki 25 Jun. 1973 161 p refs
(Contract NAS8-26234)
(NASA-CR-124355) Avail: NTIS HC $10.25 CSCL 04B

Measurements of atmospheric velocities and turbulence with the laser Doppler system were obtained, and the results compared with cup anemometer and hot-wire measurements in the same wind field. The laser Doppler velocimeter (LDV) is described along with the test procedures. It was found that mean values determined from the LDV data are within 5% of other anemometer data for long time periods, and the LDV measures higher velocities. F.O.S.

N73-30628# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, May 1973 [OBSERVATIONS CLIMATOLOGIQUES, BULLETIN MENSUEL, MAI 1973]
May 1973 15 p In FRENCH and DUTCH
Avail: NTIS HC $3.00

Meteorological parameters observed at different Belgian weather stations during May 1973 are given. ESRO

N73-30629# Army Tropic Test Center, APO New York 09827.
EVAPORIMETRY IN THE CANAL ZONE. PART 2: COMPARISON OF VARIOUS TYPES OF EVAPORIMETERS ON AN HOURLY BASIS Special Report, 1963-1969
Wilfried H. Portig Aug. 1972 32 p refs
(ARPA Order 740; DA Proj. 2M0-25001-A-724)
(AD-763205; USATTC-7301001) Avail: NTIS CSCL 04/2

The United States Army Tropic Test Center conducted a project in the Canal Zone entitled Environmental Data Base for Regional Studies in the Humid Tropics during the years 1965 through 1969. Evaporation was one of the parameters under investigation. This report discusses instrumentation available for measuring evaporation and highlights serious deficiencies encountered. Measurements using the Standard Pan and Wild, Livingstone, and Piche evaporators were compared and discrepancies studied. Evaporation loss was found to be greatly influenced by differences in measuring instruments used-location, elevation, size of blotting paper, sheltering, and amount of radiation. It was concluded that different types of evaporimeters produce different measurements, and none has been adequately related to natural evaporation. Author (GRA)

N73-30630# National Environmental Research Center, Research Triangle Park, N.C.
NERC/RTP RESEARCH PROJECTS: FISCAL YEAR 1973 (SUMMARIES OF INTRAMURAL AND EXTRAMURAL ACTIVE RESEARCH PROJECTS)
Oct. 1972 539 p refs
(PB-220259/6; EPA-R5-72-005) Avail: NTIS HC $6.00 CSCL 13B

The report has been prepared to provide information on the research conducted by the National Environmental Research Center (NERC) to the environmental community. In the overall program, emphasis is placed on three major activities: (1) measurement of human exposure including sources, transport, and distribution; (2) effects of human exposure encompassing health and socioeconomic effects; and (3) least-cost controls of technology. The document presents brief descriptions of approximately 510 research projects pursued by NERC components. GRA

N73-30631# Pacific Environmental Services, Inc., Santa Monica, Calif.
CONTROLLED EVALUATION OF THE REACTIVE ENVIRONMENTAL SIMULATION MODEL (REM), VOLUME 1 Final Report
Lowell G. Wayne, Allan Kokin, and Melvin I. Weisburd Feb. 1973 177 p refs
(Contract EPA-68-02-0345)
(PB-220456; EPA-R4-73-013a) Avail: NTIS HC $6.00 CSCL 13B

The development and validation of an operational version of the Reactive Environmental Simulation Model (REM) is presented. REM was specifically designed to handle large chemical mechanisms to assess the impact on air quality of air pollution control devices, fuels, propulsion systems, stationary sources, and transportation systems where thorough evaluation of emissions, emission constituents and reaction rates are required. The completed version contains a mechanism involving 32 reactions, 12 accumulating species, and 12 non-accumulating species. REM enables the numerical simulation of the chemical reactions that take place in a parcel or column of air moving along a dynamic wind trajectory. (Modified author abstract) GRA

N73-30632# Pacific Environmental Services, Inc., Santa Monica, Calif.
CONTROLLED EVALUATION OF THE REACTIVE ENVIRONMENT SIMULATION MODEL (REM). VOLUME 2: USER'S GUIDE
Allan Kokin, Loweel G. Wayne, and Melvin Weisburd Feb. 1973 160 p refs
(Contract EPA-68-02-0345)
(PB-220457/6; EPA-R4-73-013b) Avail: NTIS HC $6.00 CSCL 13B

The report describes the design, operation and use of the Reactive Pollution Environmental Simulation Model (REM). Its main purpose is to explain to the user how REM functions and from experience gained in operation, how it can best be used. It includes (1) detailed instructions for setting up input decks; (2) how REM may be used in performing control strategies; (3) an understanding of the methodology, techniques and calculational procedures employed in REM; and (4) sufficient information to enable program modification to be accomplished. The above tasks are facilitated by the incorporation of algorithm descriptions, flow

charts, complete data input instructions, sample input decks, a glossary of program terms and program listings in this volume.
Modified Author Abstract. (GRA)

N73-30633# Nevada Univ., Reno. Lab. of Atmospheric Physics.
PROJECT SKYWATER: FINAL REPORT OF THE DESERT RESEARCH INSTITUTE Final Report, 1 Jul. 1968 - 30 Jun. 1972
30 Jun. 1972 74 p refs
(Contract DI-14-06-D-6632)
(PB-220674/6) Avail: NTIS HC $4.50 CSCL 04B

A description is given of the winter storms of the Sierra Nevada, the purpose being to devise methods of augmenting precipitation. Problems in this area are: (1) structure of the cloud systems--their depth and degree of convectivity; (2) water droplet and ice particle economy of the clouds, forming the medium within which hydrometeor generation and growth occurs; (3) transport and diffusion of silver iodide aerosol particles, and the ballistic paths of the hydrometeors; (4) relation of these factors to the synoptic and meso-scale characteristics of the storm. Progress in developing the systems necessary to make these studies is described. Structure of the cloud systems is discussed and distribution of liquid water content are presented. Conclusions indicated by silver trace analyses with respect to the atmospheric fate of seeding materials are discussed.
(Modified author abstract) GRA

N73-30634# Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
WEATHER MODIFICATION: PRECIPITATION INDUCEMENT, A BIBLIOGRAPHY
Mar. 1973 253 p refs
(PB-220348/7; WRSIC-73-212) Avail: NTIS HC $6.75 CSCL 04B

The report, containing 169 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising selected water resources abstracts (SWRA). At the time of search for this bibliography, the data base had 53,230 abstracts covering SWRA through February 15, 1973 (Volume 6, Number 4). Author and subject indexes are included. Author (GRA)

N73-30635# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
A NUMERICAL STUDY OF MOISTURE FORECAST IN THE PLANETARY BOUNDARY LAYER
T. S. Chen Mar. 1973 82 p refs
(Grant NSF GA-29147)
(PB-220532/6; AS-Paper-198) Avail: NTIS HC $3.00 CSCL 04B

A dynamical forecast model is applied to study the moisture variation in the planetary boundary layer under the chosen synoptic condition. The observed 12-hour moisture patterns are compared with the forecast patterns. The results indicate that: (1) The mositure tongue shows a good correspondence in location between the forecast and observed values, at 200 meter-level above the ground. (2) The ridge line of the forecast moisture patterns display a tendency of tilting westward when compared with the initial observed values. The degree of tilting depends, very closely, on the speed of the cold front. (3) The forecast moisture in the central U.S. proves to be acceptable, but in the eastern U.S. along the Appalachian Mountains the error is about 2 gm/kg(-)1. (4) For the 12-hour forecast in the central U.S. region, the latent heat release seems to be more important than the evaporation effect. Author (GRA)

N73-30636# Defense Documentation Center, Alexandria, Va.
AIR POLLUTION Report bibliography, Feb. 1959 - Dec. 1972
Jun. 1973 354 p refs
(AD-761950; DDC-TAS-73-27) Avail: NTIS CSCL 13/2

The bibliography comprises citations of unclassified and unlimited reports covering air pollution, from both natural and man-made sources. References primarily deal with causes of pollution, their detection, control, treatment and elimination. Corporate author-monitoring agency, subject, title, and personal author indexes are included. GRA

N73-30637# MSA Research Corp., Evans City, Pa.
PACKAGE SORPTION DEVICE SYSTEM STUDY Final Report
A. J. Juhola Apr. 1973 517 p refs
(Contract EHSD-71-2)
(PB-221138/1; EPA-R2-73-202) Avail: NTIS HC $12.50 CSCL 13B

The report: (1) identifies and characterizes the numerous small, but objectionable, sources of gaseous pollutants; (2) ranks sources according to relative importance; (3) assesses the equipment and technology available for controlling these sources, in handbook form; (4) investigates the potential and need for development of technology and new sorbents; and (5) details research and development recommendations to improve existing devices or to develop new control methods. Emission sources amenable to control by package sorption devices contribute 15% of the total organic emissions from all sources and can be divided into two broad categories: (1) solvent-user industries that emit solvents essentially unchanged, and (2) process industries that generate pollutants by chemical, biological, or thermal reactions. It also briefly discusses monitoring and detection methods. GRA

N73-30638# Calspan Corp., Buffalo, N.Y.
AUTOMOBILE EXHAUST EMISSION SURVEILLANCE
May 1973 84 p
(Contract EPA-68-01-0435)
(PB-220755/3; APTD-1544) Avail: NTIS HC $3.00 CSCL 13B

Information on emissions from light-duty vehicles is summarized. The report contains the findings and results of three exhaust emission surveillance programs conducted by the EPA: (1) the Great Plains (Two-City) Surveillance Program, 1968-1969 Model Year Survey; (2) the National Surveillance Program, 1970 (Six City) and 1971 (Four City) Model Year Surveys; and (3) a study of emissions for Light-Duty Vehicles in Six Cities, 1957-1971 Model Year Survey. Hydrocarbon and carbon monoxide emmissions for the vehicles tested were assessed by comparing their mean emission levels with applicable Federal standards. In an effort to assess the extent to which local climate, terrain, driving practices and other geographically differentiated factors affect emissions, vehicles were sampled in cities selected to span the range of such factors. GRA

N73-30639# Reich (Brien M.), State College, Pa.
AN EVALUATION OF HURRICANE AGNES FLOODS IN COMPARISON TO BRIDGE DESIGN INFORMATION AVAILABLE FOR PENNSYLVANIA CONTEMPORANEOUSLY Final Report
Brien M. Reich 24 May 1973 59 p refs Sponsored by Fed. Highway Admin.
(PB-220888/2) Avail: NTIS HC $3.00 CSCL 04B

In the years 1970, 1971, design manuals had been issued for State of Pennsylvania on prediction of extreme rainfall and anticipated floods. On June 22, 1972, Hurricane Agnes dumped 13 inches of rain in five days, producing very severe floods. The report presents the results of comparison of extreme floods statistically predicted to actual floods caused by Hurricane Agnes. GRA

N73-30766* Arizona Univ., Tucson.
PRELIMINARY REPORT ON OPTICAL SEEING TESTS AT MT. LEMMON, MARCH - JUNE 1971
George V. Coyne *In its* Commun. of the Lunar and Planetary Lab., Vol. 9, Pt. 3 1972 p 185-189 refs (For availability see N73-30761 21-29)
(LPL-Commun-170) CSCL 04B

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N73-30640* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPACECRAFT ATTITUDE SENSOR Patent

Arthur C. Davidson and McLean M. Grant, inventors (to NASA) Issued 14 Aug. 1973 15 p Filed 2 Feb. 1971 Supersedes N71-34589 (09 - 21, p 3455)
(NASA-Case-GSC-10890-1; US-Patent-3,752,993; US-Patent-Appl-SN-111998; US-Patent-Class-250-203R; US-Patent-Class-250-209; US-Patent-Class-250-236; US-Patent-Class-244-1SA) Avail: US Patent Office CSCL 17G

A system for sensing the attitude of a spacecraft includes a pair of optical scanners having a relatively narrow field of view rotating about the spacecraft x-y plane. The spacecraft rotates about its z axis at a relatively high angular velocity while one scanner rotates at low velocity, whereby a panoramic sweep of the entire celestial sphere is derived from the scanner. In the alternative, the scanner rotates at a relatively high angular velocity about the x-y plane while the spacecraft rotates at an extremely low rate or at zero angular velocity relative to its z axis to provide a rotating horizon scan. The positions of the scanners about the x-y plane are read out to assist in a determination of attitude. While the satellite is spinning at a relatively high angular velocity, the angular positions of the bodies detected by the scanners are determined relative to the sun by providing a sun detector having a field of view different from the scanners.
Official Gazette of the U.S. Patent Office

N73-30641* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
APPARATUS FOR AIDING A PILOT IN AVOIDING A MIDAIR COLLISION BETWEEN AIRCRAFT Patent
James H. Schrader and Richard H. Couch, inventors (to NASA) Issued 31 Jul. 1973 13 p Filed 7 Apr. 1972 Supersedes N72-27703 (10 - 18, p 2463)
(NASA-Case-LAR-10717-1; US-Patent-3,750,168; US-Patent-Appl-SN-242028; US-Patent-Class-343-6.5R; US-Patent-Class-343-112CA) Avail: US Patent Office CSCL 17G

An apparatus for aiding a pilot in avoiding a midair collision between aircraft is described. A protected aircraft carries a transmitter, a transponder, a receiver, and a data processor; and an intruding cooperating aircraft carries a transponder. The transmitter of the protected aircraft continuously transmits a signal to the transponders of all intruding aircraft. The transponder of each of the intruding aircraft adds the altitude of the intruding aircraft to the signal and transmits it back to the receiver of the protected aircraft. The receiver selects only the signal from the most hazardous intruding aircraft and applies it to the data processor. From this selected signal the data processor determines the closing velocity between the protected and intruding aircraft, the range between the two aircraft, their altitude difference and the time to a possible collision.
Official Gazette of the U.S. Patent Office

N73-30642*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
MISSION SL-3 (AS 207/CM 117/IMU 31) G AND N ERROR ANALYSIS (SKYLAB 3)
S. B. Helfant Jul. 1973 31 p
(Contract NAS9-4065; DSR Proj. 55-23890)
(NASA-CR-133997; E-2785) Avail: NTIS HC $3.75 CSCL 17G

Data are presented on G and N system performance and operation for the CM. Data of measured CM IMU test data are included.
Author

N73-30643# Joint Publications Research Service, Arlington, Va.
INERTIAL NAVIGATION
V. D. Andreyev 10 Aug. 1973 24 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Tverdogo Tela (USSR), no. 1, no. 2, 1970 16 p
(JPRS-59776) Avail: NTIS HC $3.25

A simplification of inertial navigation equations that is related to the asphericity of the earth and its gravitational field is reported. Optimum dynamic characteristics of the simplest gyrocompass during the calculation of the random motion of a ship and the random deviation of the gyroscope are also discussed. For individual titles, see N73-30644 through N73-30645.

N73-30644 Joint Publications Research Service, Arlington, Va.
ON A SIMPLIFICATION OF INERTIAL NAVIGATION EQUATIONS THAT IS RELATED TO THE ASPHERICITY OF THE EARTH AND ITS GRAVITATIONAL FIELD
V. D. Andreyev and N. A. Parusnikov *In its* Inertial Navigation (JPRS-59776) 10 Aug. 1973 p 1-10 refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Tverdogo Tela (USSR), no. 1, no. 2, 1970 p 3-9 (For availability see N73-30643 21-21)

When using inertial navigation methods to determine the coordinates of a moving object in the immediate vicinity of the earth, the navigational model of the latter allowed for the asphericity of its geometrical shape and its gravitational field. The standard problem consists of a sensible combination of contradictory requirements: the navigational model must be simple enough to be used by an airborne computer, while the simplification of the model must not lead to substantial errors.
Author

N73-30645 Joint Publications Research Service, Arlington, Va.
THE OPTIMUM DYNAMIC CHARACTERISTICS OF THE SIMPLEST GYROCOMPASS DURING THE CALCULATION OF THE RANDOM MOTION OF A SHIP AND THE RANDOM DEVIATION OF THE GYROSCOPE
S. F. Burdakov and I. B. Chelpanov *In its* Inertial Navigation (JPRS-59776) 10 Aug. 1973 p 11-22 refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Tverdogo Tela (USSR), no. 1, no. 2, 1970 p 23-31 (For availability see N73-30643 21-21)

The optimum transfer function is applied to the corrector of the simplest single-rotor gyrocompass during the calculation of the law governing the random motion of a ship and the random discharge moments acting on the gyroscope around two axes. A steady state solution for both an autonomous instrument is found. Depending on the relationship between the parameters affecting the corrector, the optimum transfer functions take various forms, and the standard damped gyrocompass setup is produced for only a few variants.
Author

N73-30646*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VANGUARD/PLACE EXPERIMENT SYSTEM DESIGN AND TEST PLAN
Ralph E. Taylor Aug. 1973 22 p refs Proposed for presentation at Internatl. Telemetering Conf. (ITC/USA/'73), Washington, D. C., 9-11 Oct. 1973
(NASA-TM-X-70447; X-750-73-232) Avail: NTIS HC $3.25 CSCL 17G

A system design and test plan are described for operational evaluation of the NASA-Goddard position location and aircraft communications equipment (PLACE), at C band (4/6GHz), using NASA's ship, the USNS Vanguard, and the ATS 3 and ATS 5 synchronous satellites. The Sea Test phase, extending from March 29, 1973 to April 15, 1973 was successfully completed; the principal objectives of the experiment were achieved. Typical PLACE-computed, position-location data is shown for the Vanguard. Position location and voice-quality measurements were excellent; ship position was determined within 2 nmi; high-quality, 2-way voice transmissions resulted as determined from audience participation, intelligibility and articulation-index analysis. A C band/L band satellite trilateration experiment is discussed.
Author

N73-30647# Federal Aviation Administration, Washington, D.C.
USER'S MANUAL FOR THE LOS ANGELES BASIN STANDARD TRAFFIC MODEL (CARD DECK/CHARACTER TAPE VERSION) Final Report
Mark Hildenberger May 1973 14 p refs
(FAA-RD-73-89) Avail: NTIS HC $3.00

For users of the 1982 Los Angeles Basin Standard Traffic Model data, precise descriptions of the recorded information fields and their corresponding formats are give. Complete lists of the 25 major-size airports investigated and the 73 distinct aircraft types simulated are also included along with several directly related references to other documents pertaining specifically to the Los Angeles Basin Model project.
Author

N73-30648# Meta Systems, Inc., Santa Clara, Calif.
FLIGHT PLAN POSITION EXTRAPOLATION IN AN AUTOMATED OCEANIC AIR TRAFFIC CONTROL SYSTEM Final Report, Mar. 1972 - May 1973
Frank V. Giallanza, Charles P. Giallanza, and James C. Brown May 1973 52 p
(Contract DOT-FA72WA-2851)
(FAA-RD-73-72) Avail: NTIS HC $4.75

A method was developed to extrapolate the position of an aircraft along its flight plan route based on information contained in a stored flight plan and current meteorological data. The method assumes great circle flying. Author

N73-30649# Mitre Corp., McLean, Va.
USER'S MANUAL FOR THE LOS ANGELES BASIN STANDARD TRAFFIC MODEL Final Report
Saul Cohen and Frank Maginnis Apr. 1973 22 p refs
(Contract DOT-FA70WA-2448)
(FAA-RD-73-88; MTR-6377) Avail: NTIS HC $3.25

For users of the Los Angeles Basin Standard Traffic Model computer tapes, on the tapes and the format in which the data is recorded are described. This manual applies to users of a combined binary/character tape produced on the IBM System/360. A list of related documents is given by title and report number. Author

N73-30650# National Aviation Facilities Experimental Center, Atlantic City, N.J.
MEASUREMENT AND ANALYSES OF ASR-4 SYSTEM ERROR. PART 2: ANALYSES Interim Report, Dec. 1969 - Mar. 1970
Allen C. Busch and Paul W. Bradbury Aug. 1973 152 p refs
(FAA Proj. 142-177-010)
(FAA-NA-72-87-Pt-2; FAA-RD-73-62-Pt-2) Avail: NTIS HC $9.75

The positional accuracy of aircraft radar targets as displayed in an air traffic control airport surveillance radar system (ASR-4) was sought as one of the inputs essential for determining aircraft separation standards. Using inputs from the Atlantic City (N.J.) ASR-4, the radar targets of two test aircraft were photographed as displayed in both primary and beacon modes on scan-converted and PPI displays. The displayed positions were related to simultaneous precision track from single-target instrumentation radars (EAIR and TAIR) to derive error measures for range, azimuth, and separation. The analysis program employed a least squares analysis of variance on some 17 response variables for a set of six system control variables. Author

N73-30651# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DEVELOPMENT OF A DISCRETE ADDRESS BEACON SYSTEM Quarterly Technical Summary, 1 Apr. - 30 Jun. 1973
1 Jul. 1973 102 p refs
(Contracts DOT-FA72WAI-261; F19628-73-C-0002; FAA Proj. 034-241-012)
(FAA-RD-73-101) Avail: NTIS HC $7.25

Activities in development of a Discrete Address Beacon System (DABS) are described. Included in the report are brief reviews of: (1) DABS link design modulation and interference studies; (2) transponder design-cost studies, (3) ATCRBS transponder tests; (4) transponder antenna/airframe pattern measurements; and (5) Sensor monopulse antenna-processor studies. Also included are the results of system design studies pertaining to: the impact of locating IPC computation at the DABS sensor; the effects of synchronizing ATCRBS sensors; the effects on DABS of incorporating Synchro-DABS scheduling and requirements imposed by netting DABS sensors. Author

N73-30652# National Aviation Facilities Experimental Center, Atlantic City, N.J.
TEST AND EVALUATION OF A SYSTEM FOR PRECISE TIME DISSEMINATION USING DME(VORTAC) SYNCHRONIZATION Final Report, Jul. - Nov. 1972
Vincent J. Luciani Aug. 1973 58 p
(FAA-NA-73-23; FAA-RD-73-104) Avail: NTIS HC $5.00

The test and evaluation of an experimental system designed to provide precise time to aircraft via a DME (VORTAC) ground station modified to utilize a cesium-beam atomic clock for a time base are discussed. Data acquired from a flight test demonstrated the feasibility of this time-dissemination concept for application in time/frequency collision avoidance systems. The standard deviation of time-dissemination error was found to be 0.47 microseconds. DME one-way ranging capability was also demonstrated, wherein ranging accuracy of a modified airborne DME operated one-way averaged 0.1-nautical mile difference over that of an unmodified airborne DME in conventional two-way operation. Author

N73-30653# Mitre Corp., McLean, Va.
STATISTICAL SUMMARY OF THE 1982 LOS ANGELES BASIN STANDARD TRAFFIC MODEL, VOLUME 1 Final Report
Saul Cohen and Frank Maginnis Apr. 1973 59 p refs
(Contract DOT-FA70WA-2448; FAA Proj. 013-601-010)
(MTR-6387-Vol-1; FAA-RD-73-87-Vol-1) Avail: NTIS HC $5.00

The 1982 Los Angeles Basin Standard Traffic Model is statistically summarized. Included are the distributions of traffic by speed, altitude density, and various aircraft categories. The 1972 distributions are displayed, for comparison with those projected for 1982. In addition, an airport by airport-count between 1982 and actual data is tabulated, and the effect of excluding the less busy airports for the 1972 model is investigated. Author

N73-30654# Mitre Corp., McLean, Va.
STATISTICAL SUMMARY OF THE 1982 LOS ANGELES BASIN STANDARD TRAFFIC MODEL VOLUME 2 Final Report
Saul Cohen and Frank Maginnis Apr. 1973 277 p
(Contract DOT-FA70WA-2448; FAA Proj. 013-601-010)
(MTR-6387-Vol-2; FAA-RD-73-87-Vol-2) Avail: NTIS HC $16.00

The model for the Los Angeles Basin Standard Traffic model of the 1982 time period is dicussed. The following data are presented: (1) model snapshots, (2) listing of aircraft in the snapshot, (3) counts of the aircraft in various categories, (4) speed and altitude distributions, (5) closest distance measures, and (6) density maps. Author

N73-30655# Mitre Corp., Bedford, Mass.
FEASIBILITY ANALYSIS OF AN AIR TRAFFIC CONTROL RADAR BEACON SYSTEM (ATCRBS) BASED SURFACE TRILATERATION SURVEILLANCE SYSTEM Final Report, 1 Jun. - 1 Sep. 1972
John D. Vinatieri Jun. 1973 233 p refs
(Contract DOT-TSC-393)
(AD-763328; FAA-RD-73-75) Avail: NTIS CSCL 17/7

Analysis indicates there are feasible methods for achieving surveillance of vehicles on the airport surface by means of time-of-arrival measurements of the vehicle's ATCRBS Transponder reply at three or more receiver sites. The report contains a definition of an ATCRBS based surface surveillance system, analyses of various problems and techniques to achieve a satisfactory data acquisition subsystem, and criteria for conducting a test program for further verification of feasibility and design. GRA

N73-30656# Aerospace Corp., El Segundo, Calif. Engineering Science Operations.
APPLICATION OF EXTENDED KALMAN FILTERING TO A DYNAMIC LABORATORY CALIBRATION OF AN INERTIAL NAVIGATION SYSTEM
Frazier J. Hellings 12 Mar. 1973 251 p refs
(Contract F04701-72-C-0073)
(AD-763718; TR-0073(3115)-3; SAMSO-TR-73-219) Avail: NTIS CSCL 17/7

The report describes a data reduction technique that obtains estimates of inertial sensor error model coefficients from a dynamic laboratory calibration of a typical Inertial Navigation System. The error model coefficients are those associated with gyros, accelerometers, and their misalignment errors that have been found by test and analysis to be the predominant sources of error affecting system accuracy. All the error terms considered are categorized as either fixed (independent of applied acceleration), first-order (proportional to the first power of acceleration),

or higher-order terms, which are proportional to the square or cube of acceleration. In the case of the higher-order terms, the error model coefficients of inertial grade sensors are from one to four orders of magnitude smaller than the fixed and first-order terms. (Modified author abstract) GRA

N73-30657# Mitre Corp., McLean, Va.
AN EXTENSION OF THE THROUGHPUT RUNWAY CAPACITY METHODOLOGY TO INCLUDE MULTIPLE GLIDE PATH LENGHTS AND ANGLES Final Report
May 1973 59 p refs
(Contract DOT-FA69NS-162)
(AD-763142; MTR-6338-Vol-5; FAA-QS-73-3-V-Vol-5) Avail: NTIS CSCL 01/2

The report extends the single runway IFR (Instrument Flight Rules) capacity methodology developed in MTR-4102 to include multiple glide path lengths and angles. Particular emphasis was placed on examples which are representative of short-haul operations. Analysis was performed to indicate the sensitivity of the model to the glide path parameters, approach control system precision, separation standards, and approach speed mixes. A combination of altitude separation on the glide path is considered as a means of increasing capacity. Author (GRA)

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N73-30658*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CARBIDE FUEL PIN AND CAPSULE DESIGN FOR IRRADIATIONS AT THERMIONIC TEMPERATURES
Byron L. Siegel, Jack G. Slaby, William F. Mattson, and Dominic C. Dilanni Washington Sep. 1973 16 p refs
(NASA-TM-X-2887; E-7493) Avail: NTIS HC $2.75 CSCL 18J

The design of a capsule assembly to evaluate tungsten-emitter - carbide-fuel combinations for thermionic fuel elements is presented. An inpile fuel pin evaluation program concerned with clad temperture, neutron spectrum, carbide fuel composition, fuel geometry,fuel density, and clad thickness is discussed. The capsule design was a compromise involving considerations between heat transfer, instrumentation, materials compatibility, and test location. Heat-transfer calculations were instrumental in determining the method of support of the fuel pin to minimize axial temperature variations. The capsule design was easily fabricable and utilized existing state-of-the-art experience from previous programs. Author

N73-30659*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
UNRESTRAINED SWELLING OF URANIUM-NITRIDE FUEL IRRADIATED AT TEMPERATURES RANGING FROM 1100 TO 1400 K (1980 TO 2520 R)
Robert G. Rohal and Thomas N. Tambling Washington Sep. 1973 15 p refs
(NASA-TM-X-2907; E-7464) Avail: NTIS HC $3.00 CSCL 18J

Six fuel pins were assembled, encapsulated, and irradiated in the Plum Brook Reactor. The fuel pins employed uranium mononitride (UN) in a stainless steel (type 304L) clad. The pins were irradiated for approximately 4000 hours to burnups of about 2.0 atom percent uranium. The average clad surface temperature during irradiation was about 1100 K (1980 deg R). Since stainless steel has a very low creep strength relative to that of UN at this temperature, these tests simulated unrestrained swelling of UN. The tests indicated that at 1 percent uranium atom burnup the unrestrained diametrical swelling of UN is about 0.5, 0.8, and 1.0 percent at 1223, 1264, and 1306 K (2200, deg 2273 deg, and 2350 deg R), respectively. The tests also indicated that the irradiation induced swelling of unrestrained UN fuel pellets appears to be isotropic. Author

N73-30660# Los Alamos Scientific Lab., N.Mex.
DATA SHEETS FOR PPO RADIOISOTOPIC FUEL
T. K. Keenan, R. A. Kent, R. N. R. Mulford, and M. W. Shupe Feb. 1973 11 p refs
(Contract W-7405-eng-36)
(LA-5160-MS) Avail: NTIS HC $3.00

Preliminary data on PPO (pure plutonium oxide), a radioisotopic fuel are presented. The thermal energy of this fuel results from the radioactive decay of Pu-238 and this energy is converted into usable electric power for space probe or other applications. The basic fuel module associated with the current MHW heat source is a PPO sphere 1.465 + or - 0.015 in. diam and containing 100 + or - thermal watts. The spheres are individually encapsulated and then assembled into geometric arrays to form the working heat source. Certain properties of PuO2 with emphasis on behavior at the proposed operational conditions are listed. Author (NSA)

N73-30661# Naval Research Lab., Washington, D.C.
IRRADIATION EFFECTS ON REACTOR STRUCTURAL MATERIALS Quarterly Progress Report., 1 Feb. - 30 Apr. 1973
L. E. Steele 15 May 1973 59 p refs
(AD-763658; NRL-MR-2595) Avail: NTIS CSCL 18/10

The research program of the NRL Metallurgy Division, Reactor Materials Branch, involves a broad study of the effects of nuclear radiation upon materials. The report covering research for the period 1 February - 30 April 1973, includes: The effect of hold time on fatigue crack propagation in 20% cold worked stainless steel; the effect of implanted helium on fatigue behavior of TZM alloy; radiation enhanced metastability in a high strength structural alloy, The AEC-CE-NRL Cooperative program on A533-B reactor vessel steel; The transition temperature increase for the SM-1A pressure vessel at reactor shutdown; J-integral characterization of the SM-1A reactor pressure vessel steels; The effect of water vapor on the fatigue strength of irradiated Type 348 stainless steel; The effect of beam scanning on void formation in nickel-ion bombarded nickel. (Modified author abstract) GRA

N73-30662# Portland General Electric Co., Oreg.
EVALUATION OF AIRCRAFT HAZARDS AT THE BOARDMAN NUCLEAR PLANT SITE Final Report
K. Hornyik (Oregon State Univ.), A. H. Robinson (Oregon State Univ.), and J. E. Grund May 1973 174 p refs
(PB-220715/7; PGE-2001) Avail: NTIS HC $3.00 CSCL 18E

An assessment is presented of the probability of aircraft crashing into a proposed nuclear power generating plant located near Boardman in Morrow County, Oregon. Quantitative estimates of crash probabilities into the proposed plant are based on analyses of operations of commercial aircraft using Federal airways and the U.S. Navy aircraft use of a nearby Navy weapons System Training Facility. GRA

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics, 20 Meteorology; and 29 Space Radiation.

N73-30663 National Lending Library for Science and Technology, Boston Spa (England).
INVESTIGATION OF THE SURFACE TENSION OF REFRIGERANTS
A. R. Dorokhov, A. A. Kiriyanenko, and A. N. Solovev 5 Jul. 1973 9 p refs Transl. into ENGLISH from Kholodiln. Tekhn. (Moscow), v. 46, no. 1, 1969 p 23-25 In RUSSIAN and ENGLISH
(NLL-NEL-TT-2480-(6075.461)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

A method is described for determining the surface tension of refrigerants which permits the measurement in an inert gas atmosphere and in saturated vapors of the liquid itself. The method is based on a combination of the capillary rise and maximum pressure-in-bubble methods. The results obtained for two

refrigerants by the proposed method are compared to those obtained by other methods. D.L.G.

N73-30664 Tracor, Inc., Austin, Tex.
GUIDELINES ON NOISE
Washington, D.C. Am. Petrol. Inst. 1973 111 p refs
(EA-7301) Copyright. Avail: American Petroleum Inst., 1801 K Street, N.W., Washington, D.C. 20006 CSCL 20A

Guidelines are reported which specify noise limits which reduce the probability of hearing damage, minimize disturbances of communities, and enable effective speech communication. The topics discussed include: noise level criteria, measurement of sound, noise control, and related standards and legislations. T.M.R.

N73-30665* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SWIRL CAN PRIMARY COMBUSTOR Patent
Robert E. Jones and Richard W. Niedzwiecki, inventors (to NASA) Issued 31 Jul. 1973 4 p Filed 27 Oct. 1971 Supersedes N72-15714 (10 - 06, p 0811)
(NASA-Case-LEW-11326-1; US-Patent-3,748,853; US-Patent-Appl-SN-192970; US-Patent-Class-60-39.65; US-Patent-Class-60-39.72; US-Patent-Class-60-39.74R; US-Patent-Class-60-39.66; US-Patent-Class-431-9; US-Patent-Class-431-173) Avail: US Patent Office CSCL 21E

A swirl can full annulus combustor, operable over a wide range of exit average temperatures is used in a high performance gas turbine engine for advanced aircraft. A large number of swirl can modules are mounted in an array in each combustor. Official Gazette of the U.S. Patent Office

N73-30666* National Academy of Sciences - National Research Council, Washington, D.C.
OPTICAL DATA PROCESSING USING PARABOLOIDAL MIRROR SEGMENTS Patent
Akram S. Husain-Abidi, inventor (to NASA) Issued 14 Aug. 1973 6 p Filed 22 Feb. 1972 Supersedes N72-21662 (10 - 12, p 1642) Sponsored by NASA
(NASA-Case-GSC-11296-1; US-Patent-3,752,564; US-Patent-Appl-SN-228190; US-Patent-Class-350-162SF; US-Patent-Class-350-55) Avail: US Patent Office CSCL 20F

An optical data processing system using paraboloidal reflecting surfaces is disclosed. In the preferred embodiment the paraboloidal reflecting surfaces are segments of a paraboloidal mirror. A source of coherent light is in the focal plane of the first paraboloidal mirror segment which collimates the beam and reflects it toward a second paraboloidal mirror surface. The information to be analyzed, on a transparency for example, is placed in the collimated beam. The beam is reflected from the second paraboloidal mirror segment and focused on a Fourier transform plane. A photon detector could be placed in the Fourier transform plane or suitable spatial filters, with the filtered beam then being reflected from a third paraboloidal mirror segment to be focused on a reconstruction plane. Official Gazette of the U.S. Patent Office

N73-30667*# Kanner (Leo) Associates, Redwood City, Calif.
ELECTRICAL CONDUCTIVITY OF MATERIALS AND DETERMINATION OF THE RESISTIVITY
M. V. Bachkovskiy, B. D. Besov, V. A. Novikova, and N. F. Olofinskiy Washington NASA Sep. 1973 28 p refs Transl. into ENGLISH from publ. "Teoriya Praktika Elektricheskikh i Magnitichеskikh Metodov Separatsii Polezykh Iskopayemykh" Moscow, Nauka, 1968 p 57-76
(Contract NASw-2481)
(NASA-TT-F-15067) Avail: NTIS HC $3.50 CSCL 20C

A review is presented of data on electrical conditions of various minerals, together with methods and applications used for the determination of resistivity. Recommendations are given for selection of the most efficient methods for determining mineral resistivity under conditions of electrical separations. Author

N73-30668*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NOISE COMPARISONS FROM FULL-SCALE FAN TESTS AT NASA LEWIS RESEARCH CENTER
Marcus F. Heidmann and Charles E. Feiler 1973 20 p refs Proposed for presentation at the Aero-Acoustics Conf., Seattle, 15-17 Oct. 1973; sponsored by AIAA
(NASA-TM-X-68289; E-7637) Avail: NTIS HC $3.00 CSCL 20A

The overall aero and acoustic design features of eight 6-foot-diameter, single stage fans tested in an outdoor acoustic facility are described. A correlation of the acoustic results for subsonic tip-speed fans showed the total sound power was proportional to the mechanical power imparted to the fan and the specific work performed on the air to within + or - 2 dB. The correlation was relatively insensitive to fan design variables over a broad range of operating conditions. Maximum perceived noise levels were generally proportional to the sound power levels with both noise levels exhibiting a relatively unique increase with fan pressure ratio when normalized by the delivered thrust. Author

N73-30669*# El-Sum Consultants, Atherton, Calif.
DIAGNOSTIC TECHNIQUES FOR MEASUREMENT OF AERODYNAMIC NOISE IN FREE FIELD AND REVERBERANT ENVIRONMENT OF WIND TUNNELS
H. M. A. El-Sum and O. K. Mawardi May 1973 126 p refs (Contract NAS2-6872)
(NASA-CR-114636) Avail: NTIS HC $8.50 CSCL 20A

Techniques for studying aerodynamic noise generating mechanisms without disturbing the flow in a free field, and in the reverberation environment of the ARC wind tunnel were investigated along with the design and testing of an acoustic antenna with an electronic steering control. The acoustic characteristics of turbojet as a noise source, detection of direct sound from a source in a reverberant background, optical diagnostic methods, and the design characteristics of a high directivity acoustic antenna. Recommendations for further studies are included. F.O.S.

N73-30670# Air Weather Service, Washington, D.C.
USAFETAC REFRACTIVE INDEX GRADIENT SUMMARIES
Allen R. Davis and Richard C. Wagner Apr. 1973 17 p refs
(AD-762501; USAFETAC-TN-73-4) Avail: NTIS HC $3.00

Upper-air soundings are used to compute refractive-index gradients in the lower atmosphere which cause normal and anomalous propagation of radio waves. The computer-produced summaries of these gradients are described. Gradients are described by height of base and thickness for each of the four categories: sub-refractive, normal, super-refractive, and trapping. Tables also describe gradients by height of base in discrete intervals, and monthly distributions of the minimum gradient for each sounding. Author

N73-30671# Communications Research Centre, Ottawa (Ontario).
A SPECTROSCOPIC DETERMINATION OF THE 3P0 YIELDS 3F2 AND 3P0 YIELDS 3H6 TRANSITIONS OF THE Pr(3 PLUS) ION IN SeOCl2:SnCl4
A. Watanabe Jul. 1973 17 p refs
(CRC-1243) Avail: NTIS Hc $3.00

A spectroscopic method was used to determine the induced emission cross section for the 3 P 0 yields 3 F 2 and 3 P 0 yields 3 H 6 transitions of th Pr(3+) ions in an aprotic solvent system consisting of a mixture of SeOCl2 and SnCl4. The values obtained were 4.3 x 10 to the -19th power sq cm and 2.0 x 10 to the -19th power sq cm, respectively. The former value is five times as large as the value 0.85 x 10 to the -19th power sq cm for the low threshold laser transition of the Nd(3+) ion in the same solvent system. Author

N73-30672*# Loughborough Univ. of Technology (England). Dept. of Transport Technology.
PROPAGATION OF SOUND IN ELLIPTIC DUCTS
M. V. Lowson and S. Baskaran Jul. 1973 13 p refs Sponsored in part by Natl. Gas Turbine Establishment
(Grant NGR-52-140-002)
(NASA-CR-132307; TT-7307) Avail: NTIS HC $3.00 CSCL 20A

The propagation of sound in elliptic ducts has been investigated as a model case to determine the acoustic effects of departures from symmetry in a circular duct. The cut-off frequencies of the higher order circumferential modes in an

elliptic duct have been calculated for various duct eccentricities. The lowest orders demonstrate an increase in cut-off frequency with eccentricity for the odd functions and a decrease for the even, in agreement with previous work. However the higher order modes show virtually no difference between odd and even functions and only a very small decrease in cut-off frequency compared with a circular duct of the same area. The practical implication of the results appears to be that even large deformations of the duct shape will have little effect providing duct area remains constant. Author

N73-30673*# California Univ., Berkeley. Space Sciences Lab.
MECHANICS OF WHEEL-SOIL INTERACTION Final Report
H. John Houland Apr. 1973 140 p refs
(Grant NGR-05-003-406)
(NASA-CR-133860; SSL-Ser-14-Issue-23) Avail: NTIS HC $9.00 CSCL 20K

An approximate theory for wheel-soil interaction is presented which forms the basis for a practical solution to the problem. It is shown that two fundamental observations render the problem determinate: (1) The line of action of the resultant of radial stresses acting at the wheel soil interface approximately bisects the wheel-soil contact angle for all values of slip. (2) A shear stress surface can be hypothesized. The influence of soil inertia forces is also evaluated. A concept of equivalent cohesion is introduced which allows a convenient experimental comparison for both cohesive and frictional soils. This theory compares favorably with previous analyses and experimental data, and shows that soil inertia forces influencing the motion of a rolling wheel can be significant. Author

N73-30674# Brookhaven National Lab., Upton, N.Y.
PROCEEDINGS OF THE FOURTH INTERNATIONAL CONFERENCE ON MAGNET TECHNOLOGY
Y. Winterbottom, ed. 1972 325 p refs Conf. held at Brookhaven, N. Y.
(Conf-720908) Avail: NTIS

In connection with the construction of ac to dc converters or flux pumps for powering dc superconducting beam magnets, several techniques were developed that improve the performance of the ac inductance coils, transformers, and magnetic switches used in the pump. Details of the construction of these components are discussed along with performance data on a 500 A pump built for a beam splitter magnet. Author (NSA)

N73-30675# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.
MOTION OF A BORN-RIGID BODY IN GENERAL RELATIVITY
S. P. Evtushenko 1972 24 p refs In RUSSIAN; ENGLISH summary
(ITF-72-106-P) Avail: AEC Depository Libraries HC $3.25 CSCL 20K

Within general relativity, it is shown that the motion of continuum of the material points which satisfy the differential conditions of a Born rigidity can be represented as the moment of a chosen point and rotation of the rest around the one singled out. Author (NSA)

N73-30676# Rome Univ. (Italy). Inst. of Physics.
ON RAMAN SPECTROSCOPY OF TURBID SUSPENSIONS AND POWDERS [SULLA SPETTROSCOPIA RAMAN DI SOSPENSIONI TORBIDE E POLVERI]
V. Mazzacurati 23 Nov. 1971 50 p In ITALIAN
(Nota-Interna-346) Avail: NTIS HC $4.50

Experimental design parameters for Raman spectroscopy of turbid suspensions, solutions, and powders, using ion gas laser light sources, were studied theoretically for improvement of the S/N ratio. An expression for this quantity in terms of instrumental and physical parameters was derived for a multipass grating monochromator and photomultiplier set-up. A methodology is given to optimize parameters such as scattering volume, solvent concentration, optics focusing, and analyzer resolution in the case of a two-component mixture. The formalism is adaptable to the Raman analysis of powders using a formal Tyndall coefficient of order 2/lambda and the related mathematical expression transformations. A reduction by a factor one million of the elastically stray light is theoretically achievable, under specified conditions, by using a unimode laser light source and a Fabry-Perot interferometer located between the analyzer and the photomultiplier. ESRO

N73-30677# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Abteilung Stroemungen Geringer Dichte und Hoher Enthalpie.
DENSITY AND TEMPERATURE MEASUREMENTS IN NONRADIATING GASES BY ANALYSIS OF SCATTERED LIGHT [MOEGLICHKEITEN DER STREULICHTANALYSE ZUR DICHTE- UND TEMPERATURMESSUNG IN NICHTSTRAHLENDEN GASEN]
G. Schweiger and M. Fiebig Bad Godesberg, West Ger. Bundesmin. fuer Bildung und Wiss. Jul. 1972 35 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-W-72-20) Avail: NTIS HC $3.75; ZLDI, Munich 6,75 DM

The possibility of analyzing nonradiating flow in wind tunnels using light scattering experiments was investigated. A theoretical analysis of the Rayleigh, Thomson, MIE scattering, and resonance scattering showed that gas density and temperature, electron density, can be measured from gas light scattering analysis. The determination of local gas density by the light scattering technique was proved by experiments. Possible application of laser light scattering technique to the investigation of ablation during atmospheric entry of space vehicles is presented. ERSO

N73-30678# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Freiburg (West Germany). Inst. fuer Angewandte Mathematik und Mechanik.
EXACT EQUATIONS FOR THE TRANSPORT COEFFICIENTS OF A FIVE-COMPONENT-MIXTURE AS A MODEL GAS OF DISSOCIATED AIR Ph.D. Thesis - Karlsruhe Univ., West Ger., 1971
Dieter Straub 5 May 1972 93 p refs In GERMAN; ENGLISH summary
(DLR-FB-72-34) Avail: NTIS HC $6.75; DFVLR, Porz, West Ger. 22,40 DM

Dissociated air is assumed as an ideal five-component-mixture consisting of N2, O2, NO, N, and O. Equations are derived from viscosity, molecular heat conductivity, multicomponent diffusion, and multicomponent thermal diffusion of this air model by use of qualified mean values for the mol masses and the essential collision integrals. These equations explicitly describe the dependence of all the transport coefficients on pressure, temperature and concentration; they are exact in the meaning of the first Chapman-Enskog-approximation. Accordingly, the accuracy of the numerical results is directly related to the reliability of the used collision integrals which may be determined within an accuracy of + or - 5% at best for the time being.
Author (ESRO)

N73-30679# Bureau of Mines, Reno, Nev. Metallurgy Research Center.
PREPARATION OF SAMARIUM-COBALT PERMANENT MAGNETS
J. W. Walkiewicz, J. S. Winston, and M. M. Wong 1973 21 p refs
(BM-RI-7784) Avail: NTIS HC $3.25

A method for fabricating Sm-Co permanent magnets was developed. This method consisted of arc melting, crushing and grinding the alloy, aligning and pressing the powder, and sintering the green compacts. Results indicated that the optimum composition was 36.7 + or - 0.3 weight-percent Sm and 63.3 + or - 0.3 weight-percent Co. This composition was obtained by blending together Sm2Co7 and SmCo5. The maximum values experimentally obtained were BHc = 27.4 KOe, BHc = 7,510 Oe, Br = 7,810 G, and (BH)max = 15.1 MGOe. The optimum sintering temperatures and grinding times for maximum mHc and (BH) max were determined. Lowering the grinding temperature from 0 C to -60 C resulted in a significant increase of magnetic properties. Author

N73-30680# Army Materiel Command, Redstone Arsenal, Ala. SAM-D Project Office.
QUITON/PERCEPTION PHYSICS: A THEORY OF EXIST-

ENCE, PERCEPTION, AND PHYSICAL PHENOMENA
Thomas E. Bearden 5 Mar. 1973 42 p
(AD-763210) Avail: NTIS CSCL 20/10

A fundamental answer is attempted to the question of being, time, space, existence, perception, and physical phenomena. Mass, empty space, reality, gravitational attraction, continuity, discontinuity, and relativity are among the things and nonthings for which relationships and explanations are provided. Perception is defined as detection by a mass of change to itself and as a differentiating process. Perceived physical phenomena are revealed to be first derivatives of ultimate reality, and outputs of the physical perceiving device called the perceptron. Using the operation of the physical perception process on action, the units of which are energy times time, an entirely different view is generated of both reality and the Heisenberg uncertainty principle. When superposition is imposed as a condition, the Heisenberg uncertainty principle is revealed to be a quantized statement. A concept of the absolute value of a dimensional molecule is advanced. (Modified author abstract) GRA

N73-30681# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOME REGULARITIES IN THE PROPAGATION OF PERTURBATIONS OF A DISCRETE TONE IN A FREE SUPERSONIC JET
V. N. Glaznev 7 Jun. 1973 14 p refs Transl. into ENGLISH from Izv. Sibirsk. Otd. Akad. Nauk SSSR, Ser. Tekhn. Nauk (Novosibirsk), no. 8, Jun. 1972 p 37-40
(AF Proj. G101)
(AD-763163; FTD-HT-23-606-73) Avail: NTIS CSCL 20/1

Small perturbations, being propagated along a jet, experience a discontinuity on the boundaries of the cells which causes the emanation of sound into the surrounding space. The sound perturbations, reaching the section of the nozzle, in turn engender new perturbations in the jet. Thus, a self-oscillating process is established. The frequency of the discrete tone depends on the speed of sound in surrounding space, the dimensions of the cell, and the rate of propagation of the perturbations in the jet. The works which are presented are devoted to a study of various parts of the structure of the acoustic field of the jet. GRA

N73-30682# Army Foreign Science and Technology Center, Charlottesville, Va.
INVESTIGATION OF ATMOSPHERIC EFFECTS ON LIGHT DISTANCE FINDER MEASUREMENT RESULTS
A. L. Ostrovskii 2 Apr. 1973 23 p refs Transl. into ENGLISH from Geod., Kartografiya i Aerofotosemka (Lvov), no 7, 1968 p 28-40
(AD-763505; FSTC-HT-23-1552-72) Avail: NTIS CSCL 20/6

An experimental study of atmospheric influences on the precision of light range finder measurements in hilly terrain is discussed. GRA

N73-30683# Aerospace Corp., El Segundo, Calif. Electronic Research Lab.
IMAGING OF EXTENDED OBJECTS THROUGH A TURBULENT ATMOSPHERE
Hal T. Yura (Pacific Sierra Res. Corp.) and Richard F. Lutomirski 28 Jun. 1973 38 p refs
(Contract F04701-72-C-0073)
(AD-763717; TR-0073(3230)-4; SAMSO-TR-73-213) Avail: NTIS CSCL 20/6

The extended Huygens-Fresnel principle is used to derive an explicit expression for the image plane illuminance distribution of an extended object with an arbitrary luminance emittance distribution. The combined simultaneous effects of attenuation, background luminance, and atmospheric turbulence are given. A quantitative comparison of these effects is made, and their contribution to the overall loss in resolution is given. In particular, the authors derive a quantitative expression for the point spread function of the combined atmospheric-optical system. Explicit expressions are derived for both the atmospheric-optical system modulation transfer function (MTF) and image plane modulation. Numerical results for the image plane modulation are presented for imaging both up and down along an atmospheric path. Author (GRA)

N73-30684# Army Materiel Command, Washington, D.C.
ENGINEERING DESIGN HANDBOOK ON INFRARED MILITARY SYSTEMS, PART 1
Khalil Seyrafi, ed. (Electro-Optical Res. Co.) 7 May 1973 574 p refs Revised
(AD-763495; AMCP-706-127-Pt-1) Avail: NTIS CSCL 20/6

The publication is one of a group of handbooks prepared under the auspices of the Engineering Handbook Office, Duke University, as part of the Engineering Design Handbook Series. Presented in this handbook are the basic information and fundamental principles essential to the design and development of infrared systems for military applications. Most of the material is devoted to the significant technological advances of recent years. GRA

N73-30685# California Univ., Los Angeles. School of Engineering and Applied Science.
SCATTERING OF WAVES BY PENETRABLE OBJECTS Final Report, Feb. 1969 - Jan. 1973
C. Yeh Jun. 1973 22 p refs
(Contract N00014-69-A-0200-4026)
(AD-762802; UCLA-ENG-7345) Avail: NTIS CSCL 20/1

The research dealt in general with the application of various mathematical techniques to the problems of the interaction of acoustic or electromagnetic waves with complex bodies that are of practical interests to the Navy. Author (GRA)

N73-30686# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
INVESTIGATION OF JET NOISE USING OPTICAL HOLOGRAPHY Final Report, Feb. - Aug. 1972
Richard F. Salant Apr. 1973 60 p refs
(Contract DOT-TSC-146)
(PB-220641/5; DOT-TSC-146-2; DOT-TSC-OST-73-11) Avail: NTIS HC $4.50 CSCL 14B

Holographic interferograms were made of cold, laboratory scale, supersonic air and nitrogen jets in the Mach number range of 2.1 to 3.4, and of helium jets in the Mach number range of 1.5 to 2.95. These holograms demonstrate that the acoustic field in the vicinity of such jets is dominated by Mach waves, each of which can be traced back to a generating disturbance within the jet. The Mach waves are generated from an axial position slightly downstream of the nozzle exit to a position near the tip of the potential core. Measurements of Mach angle indicate that the average convection velocity of the generating disturbances in the air/nitrogen jet is approximately 84% to 90% of the jet velocity for the Mach number range of 2.1 to 2.7, and approximately 77% of the jet velocity for the Mach number range of 2.8 to 3.4. (Modified author abstract) GRA

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N73-30687# Laboratoire de Physique Theorique et des Hautes Energies, Orsay (France).
BARYON SPECTROSCOPY AND REGULARITIES BETWEEN SU(6) AND SU(3) MASS BREAKING PARAMETERS
Michel Fontannaz Jul. 1973 10 p refs
(LPTHE-73/21) Avail: NTIS HC $3.00

It was verified that the parameters which describe the breaking of SU(3) have many different values. A quark model is used to show that such a correlation also exists for baryons. Author

N73-30688# Laboratoire de Physique Theorique et des Hautes Energies, Orsay (France).
STRING MODEL AND MULTIPRODUCTION
X. Artru and G. Mennessier Jul. 1973 43 p refs Submitted for publication
(LPTHE-73/22) Avail: NTIS HC $3.25

The string model for the hadrons offers a classical description of high energy collisions which accounts for the following

features: lending particle effect, limiting fragmentation, rapidity plateau, logarithmic growth of multiplicity, and small transverse momenta. A simplified two-dimensional model allows a quantitative study of these properties as well as the effect of SU(3) mass breaking. The relevance of this model to current induced reactions is discussed, and some predictions are made concerning e(+)e(-) yields hadrons. Author

N73-30689*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COMPUTER PROGRAM FOR DETERMINING ROTATIONAL LINE INTENSITY FACTORS FOR DIATOMIC MOLECULES
Ellis E. Whiting Washington Sep. 1973 63 p refs
(NASA-TN-D-7268; A-4863) Avail: NTIS HC $3.50 CSCL 20H

A FORTRAN IV computer program, that provides a new research tool for determining reliable rotational line intensity factors (also known as Honl-London factors), for most electric and magnetic dipole allowed diatomic transitions, is described in detail. This users manual includes instructions for preparing the input data, a program listing, detailed flow charts, and three sample cases. The program is applicable to spin-allowed dipole transitions with either or both states intermediate between Hund's case (a) and Hund's case (b) coupling and to spin-forbidden dipole transitions with either or both states intermediate between Hund's case (c) and Hund's case (b) coupling. Author

N73-30690*# Wisconsin Univ., Madison. Theoretical Chemistry Inst.
MOLECULAR COLLISIONS. 11: SEMICLASSICAL APPROXIMATION TO ATOM-SYMMETRIC TOP ROTATIONAL EXCITATION
Dennis Russell and C. F. Curtiss 24 Aug. 1973 22 p refs
(Grants NGL-50-002-001; NSF GP-28213A1)
(NASA-CR-133849; WIS-TCI-499) Avail: NTIS HC $3.25 CSCL 20H

In a paper of this series a distorted wave approximation to the T matrix for atom-symmetric top scattering was developed which is correct to first order in the part of the interaction potential responsible for transitions in the component of rotational angular momentum along the symmetry axis of the top. A semiclassical expression for this T matrix is derived by assuming large values of orbital and rotational angular momentum quantum numbers. Author

N73-30691# Rome Univ. (Italy). Inst. of Physics.
MEASUREMENT OF PION(+)PION(-) AND PION(0)PION(0) PHOTOPRODUCTION DIFFERENTIAL CROSS SECTIONS FOR INCIDENT GAMMA-RAY ENERGIES FROM 600 TO 900 MeV
M. Beneventano, S. Dangelo, F. deNotaristefani, P. Monacelli, L. Paoluzi, P. Persi, F. Sebastiani, and M. Severi [1972] 43 p refs Submitted for publication Sap HC $4.25
Avail: NTIS

Cross sections of reactions gamma + proton yields proton + positive pion + negative pion and gamma + proton yields proton + double neutral pions were measured at the 1.1 GeV Frascati electrosynchrotron for photon energies ranging from 600 to 900 MeV, for five proton momenta, and at fixed 32 deg laboratory angle. The cross sections of positive and negative photoproduction exhibited behaviors in agreement with the delta baryon production. No immediate evidence was found of contribution of double neutral pion interactions. The mean value of the ratio position pion negative pion/neutral pion is 2.7 + or - 0.3. ESRO

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N73-30692# Illinois Univ., Urbana. Aeronomy Lab.
TRANSIENT RESPONSE OF STRATIFIED MEDIA: RESPONSE TO AN ARBITRARY INCIDENT PLANE WAVE
K. G. Gray and S. A. Bowhill [1973] 22 p refs Submitted for publication
(Grant NSF GA-36911X)
Avail: NTIS HC $3.25

The response of a stratified cold plasma to an infinite plane electromagnetic wave incident vertically on the ionization is studied. The transient response is found by utilizing a multiple scattering technique, by summing a large number of scalar functions described as first scatter, second scatter, etc. A generalized formula is used for finding the nth scattered field in terms of the (n-1)th scattered field. Specifically two cases are considered: the generalized response of a half space of uniform electron density to any incident wave expressible in a Maclaurine series; and the response of an infinite region whose electron density increases exponentially with height to an incident step-modulated sine wave. Author

N73-30693# Illinois Univ., Urbana. Dept. of Electrical Engineering.
TRANSIENT RESPONSE OF STRATIFIED MEDIA: MULTIPLE-SCATTERING INTEGRAL AND DIFFERENTIAL EQUATION FOR AN IMPULSIVE INCIDENT PLANE WAVE
K. G. Gray and S. A. Bowhill [1973] 21 p refs Submitted for publication
(Grant NSF GA-36911X)
Avail: NTIS HC $3.25

Response of a stratified cold plasma to an infinite plane impulsive electromagnetic wave incident vertically on the ionization is studied. The impulse response is found by utilizing a multiple scattering technique, by summing a larger number of scalar functions described as first scatter, second scatter, etc. A multiple scattering integral is derived for finding the nth scattered field in terms of the (n-1)th scattered field. Also a partial differential equation for the impulse response is derived using the multiple scattering technique. Its solution is found for an impulsive wave incident on a half space of uniform electron density, and on an infinite region whose electron density increases exponentially with height. Author

N73-30694*# Stanford Univ., Calif. Inst. for Plasma Physics.
A THEORY FOR SCATTERING BY DENSITY FLUCTUATIONS BASED ON THREE-WAVE INTERACTION
K. J. Harker and F. W. Crawford Jun. 1973 38 p refs
(Grant NGL-05-020-176; Contract N00014-67-A-0112-0066; ARPA Order 1773)
(NASA-CR-133808; SUIPR-517) Avail: NTIS HC $4.00 CSCL 20I

The theory of scattering by charged particle fluctuations of a plasma is developed for the case of zero magnetic field. The source current is derived on the basis of: (1) a three wave interaction between the incident and scattered electromagnetic waves and one electrostatic plasma wave (either Langmuir or ion acoustic), and (2) a synchronous interaction between the same two electromagnetic waves and the discrete components of the charged particle fluctuations. Previous work is generalized by no longer making the assumption that the frequency of the electromagnetic waves in large compared to the plasma frequency. The general result is then applied to incoherent scatter, and to scatter by strongly driven plasma waves. An expansion is carried out for each of those cases to determine the lower order corrections to the usual high frequency scattering formulas. Author

N73-30695*# California Univ., Los Angeles.
THEORETICAL STUDY OF NONLINEAR WAVES AND SHOCK-LIKE PHENOMENA IN HOT PLASMAS Final Report
B. D. Fried, A. Banos, Jr., and C. F. Kennel 29 May 1973 9 p refs
(Grant NGL-05-007-116)
(NASA-CR-132808) Avail: NTIS HC $3.00 CSCL 20H

Summaries are presented of research in basic plasma physics. Nonlinear waves and shock-like phenomena were studied which are pertinent to space physics applications, and include specific problems of magnetospheric and solar wind plasma physics. F.O.S.

N73-30696*# Boeing Aerospace Co., Seattle, Wash. Research and Engineering Div.
ACTIVE CLEANING TECHNIQUE DEVICE

R. L. Shannon and R. B. Gillette Mar. 1973 64 p refs
(Contract NAS8-28270)
(NASA-CR-124335; D180-15454-1) Avail: NTIS HC $5.25 CSCL 20I

The objective of this program was to develop a laboratory demonstration model of an active cleaning technique (ACT) device. The principle of this device is based primarily on the technique for removing contaminants from optical surfaces. This active cleaning technique involves exposing contaminated surfaces to a plasma containing atomic oxygen or combinations of other reactive gases. The ACT device laboratory demonstration model incorporates, in addition to plasma cleaning, the means to operate the device as an ion source for sputtering experiments. The overall ACT device includes a plasma generation tube, an ion accelerator, a gas supply system, a RF power supply and a high voltage dc power supply. Author

N73-30697*# Boeing Aerospace Co., Seattle, Wash.
ACTIVE CLEANING TECHNIQUES FOR REMOVING CONTAMINATION FROM OPTICAL SURFACES IN SPACE Quarterly Progress Report
R. L. Shannon and R. B. Gillette 1973 34 p refs
(Contract NAS8-26385)
(NASA-CR-124374; QPR-8) Avail: NTIS HC $3.75 CSCL 20I

Research in developing an active cleaning technique for removing contaminants from optical surfaces in space is reported. In situ contamination/cleaning experiments were conducted on gold and platimum coated mirrors, which were contaminated by exposure to UV radiation in a 1,3, butadiene environment. Argon and oxygen plasma exposure cleaned the mirrors equally well. Silicone cleaning experiments were also conducted. Exposure of the contaminated mirrors to helium, oxygen, and hydrogen plasmas restored the reflectance at the shorter wavelengths and degraded it at the longer wavelengths. Author

N73-30698*# Grambling Coll., La. Dept. of Physics.
STUDY OF LOW FREQUENCY HYDROMAGNETIC WAVES USING ATS-1 DATA Semiannual Status Report
W. D. Cummings 21 Jun. 1973 21 p refs
(Grant NGR-19-011-007)
(NASA-CR-133847) Avail: NTIS HC $3.25 CSCL 20I

The Pc4 and Pc5 micropulsations observed at ATS-1 were cataloged. The ATS-1 data were compared with data from other satellites. Polarization of the waves was also studied. Author

N73-30699# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Technische Physik.
APPLIED MAGNETOHYDRODYNAMICS. VOLUME 11: OUTLOOK AND POSSIBILITY FOR MHD GAS COMBUSTION GENERATORS WITH AIR TURBINE FOR NUCLEAR PLANT APPLICATION IN THE BRD
G. Noack Oct. 1972 155 p refs In GERMAN
(JUL-892-TP-Vol-11) Avail: AEC Depository Libraries $9.75

Based on the present and on the projected energy needs of West Germany, MHD generators with gas fuel are analyzed. The analysis considers natural gas and air enriched with oxygen to obtain the high temperatures required by the MHD generator. Data about high flame temperatures are listed and discussed in detail. Under the conditions prevailing in West Germany, the best arrangement is offered by an MHD generator with subsequent air turbine. The design of such an arrangement is discussed thoroughly from the technical as well as the structural point of view. NSA

N73-30700# Rensselaer Polytechnic Inst., Troy, N.Y.
ION BEAM PROBE PLASMA DIAGNOSTIC SYSTEM Annual Progress Report, 1 May 1972 31 Jan. 1973
R. L. Hickok, W. C. Jennings, G. S. Huchital, and R. E. Reinovsky Mar. 1973 69 p refs
(Contract AT(11-1)-2229)
(COO-2229-2) Avail: NTIS HC $5.50

It is shown that the non-toroidal components of the CF field on the ST Tokamak rotated and demagnified the Z displacement of the secondary ions at the detector. Furthermore, it is shown that this distortion can be subtracted out in the data reduction process. Preliminary design of a beam probe system for Doublet 2, subject to the constraint of minimizing the entrance and exit ports, has been completed and shows that such a diagnostic system would permit measurements all along a line passing through the upper focal point. Considerable progress was made on the design of a beam probe system for the UARL Baseball device. This design would permit measurements throughout a small volume near the center of the system using a single fixed detector. It is shown that a two ion species beam probe system can be used to measure electron temperature in the range of 5 to 200 eV. Experimental verification at 7 eV was obtained on the RPI hollow-cathode discharge.
Author (NSA)

N73-30701# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
APPLICATION OF INDUCTIVE PLASMA PULVERIZATION TO PRODUCTION OF MECHANICAL AND ELECTRONIC COMPONENTS
J. Daniault, J. DeGoer, and C. Parayre 1972 7 p refs In FRENCH Presented at the 2d Intern. Colloq. on the Appl. of Sci. Vacuum Tech. to Coatings and Surface States, Lyon, 19-22 Sep. 1972
(CEA-Conf-2111; Conf-720974-1) Avail: AEC Depository Libraries

In inductive plasma pulverization a magnetic induction coil of the material to be protected is placed in a vacuum chamber and supplied by a high-frequency generator. By the controlled admission of a gas or a gaseous mixture under the effect of the high-frequency field, a plasma is confined at the interior of the coil. It is volatilized progressively and deposited on objects placed in the chamber. The application of this technique to Al interconnections for integrated circuits with MOS transistors, glass plates covered with Ni for electrical contacts in neutron multidetectors, coils for measurement of the diamagnetism of plasmas, deposition of stainless steel on long Cu tubes, deposition of Si and Si3N4, deposition of W on Cu, deposition of Dy on pyrocarbon, deposition of Al2O3 on Si and deposition of corrosion protection coatings are described. Deposits of high purity Nb on Al2O3 by this process are superconductors. NSA •12;ted

N73-30702# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
TRAVELING WAVE OF A MAGNETIC FIELD HAVING VARIABLE PHASE VELOCITY AND AMPLITUDE DURING MOVEMENT OF A LIQUID METAL IN AN EXPANDING CHANNEL
K. I. Kim, A. I. Syusyukin, and V. T. Chemeris 20 Jun. 1973 14 p refs Transl. into ENGLISH from Probl. Tekh. Elektro. (USSR), no. 32, 1971 p 35-40
(AD-763159; FTD-HT-23-410-73) Avail: NTIS CSCL 20/9

The results derived in the report thus obtained can be used for a numerical calculation of the electromagnetic characteristics of MHD machines having a variable rate of liquid flow into the channel and a variable phase velocity and amplitude for the traveling wave of the excitation field. GRA

N73-30703# Naval Research Lab., Washington, D.C.
TWO-DIMENSIONAL STUDY OF ELECTRON-ION STREAMING INSTABILITIES
Martin Lampe, Irving Haber, Joseph H. Orens, and Jay P. Oris May 1973 50 p refs
(NRL Proj. 77H02-27)
(AD-763336; NRL-MR-2587) Avail: NTIS CSCL 20/9

The authors present a two-dimensional study, based on computer simulation, of strong electron-ion streaming instabilities induced by counter-streaming ion beams, for initially cold electrons ((v sub e) mach - (v sub d)). Wave growth agrees well with linear theory initially. Higher harmonics appear later, in good agreement with mode coupling theory. The wave spectrum, initially very broad perpendicular to the streaming direction, narrows as the electrons heat and the waves saturate, in accordance with quasi-linear theory. Electron heating is explained by non-resonant quasi-linear diffusion at early times, and by resonant turbulent diffusion at later times. In contrast to previous one-dimensional studies, the authors found that electron heating continues well after wave saturation and after (v sub e) = (v sub d). However the heating rate at late times is somewhat reduced by partial plateau formation in the electron velocity distribution. Coherent electron trapping is not seen, as it is in

the one-dimensional situation, but coherent ion trapping does occur and dominates the wave dynamics at late times, terminating wave growth on the time scale studied. Author (GRA)

N73-30704# California Univ., Los Angeles. School of Engineering and Applied Science.
OPTIMAL CONTROL OF PARABOLIC SYSTEMS WITH BOUNDARY CONDITIONS INVOLVING TIME-DELAYS
P. K. C. Wang Jun. 1973 36 p refs
(Grant AF-AFOSR-2303-72; AF Proj. 9752)
(AD-763738; UCLA-ENG-7346; AFOSR-73-1152TR) Avail: NTIS CSCL 20/9

Various optimal control problems with quadratic cost functionals for parabolic systems with Neumann boundary conditions involving time-delays are considered. Necessary and sufficient conditions for which the optimal controls must satisfy are derived. Estimates and a sufficient condition for the boundedness of solutions are obtained for systems with more complex boundary conditions involving time-delays are discussed briefly. Author (GRA)

N73-30705# Austin Science Associates, Inc., Tex.
TURBULENT HEATING OF PLASMAS BY STREAMING INSTABILITIES
William E. Drummond, James R. Thompson, and Henry V. Wong Jun. 1973 43 p
(Contract F44620-72-C-0071; AF Proj. 97520)
(AD-763777; ARA-106; I-ARA-73-U-88; AFOSR-73-1147TR) Avail: NTIS CSCL 20/9

During the past year of work on this contract, substantial progress has been made toward the research goal of understanding the development and nature of turbulence generated from a source of free streaming energy within a collisionless plasma. The authors have concentrated this year on the case in which a powerful beam of energetic electrons is externally generated and injected into a target plasma to heat it. Our calculations indicate the possibility of efficiently coupling the large beam energy into a magnetized target plasma during the very brief transit time of the beam, provided that the beam quality is sufficiently high, and that the beam energy and density are adjusted to optimize the primary beam-plasma turbulent interaction. In addition an analyses was made which revealed conditions for the equilibria and stability of unneutralized electron beams propagating along a magnetic guide field. (Modified author abstract) GRA

N73-30706# Texas Technological Univ., Lubbock. Dept. of Electrical Engineering.
OPTICAL MEASUREMENTS IN FUSION RESEARCH
Jim Thompson 1973 15 p refs Presented at Ann. Southwestern IEEE Conf., 25th, Houston, Tex., 4-6 Apr. 1973
(Grant AF-AFOSR-1757-69; AF Proj. 9752)
(AD-763802; AFOSR-73-1206TR) Avail: NTIS CSCL 20/9

Optical diagnostic techniques used to determine the plasma refractive index are discussed. The relationship between the refractive index and the plasma density and magnetic field is established. General interferometric principles are explained and the observable fringe shifts related to the plasma density. Various interferometers producing either space or time resolved density data are described. Schlieren and shadowgraph methods for determining the plasma density gradients are discussed in addition to phase contrast techniques and their application to plasma density determination. The use of Faraday rotation techniques to determine the plasma magnetic field is also considered. Author (GRA)

N73-30707# Illinois Univ., Urbana. Coordinated Science Lab.
NONLINEAR DEVELOPMENT OF THE ION ACOUSTIC INSTABILITY IN A LOW PRESSURE DISCHARGE
Masaaki Yamada May 1973 130 p refs
(Contract DAAB07-72-C-0259)
(AD-763590; R-612; UILU-Eng-73-2214) Avail: NTIS CSCL 20/9

The linear and nonlinear stage of the ion-acoustic instability in a low pressure discharge in helium was investigated extensively. The linear stage was found to be well described by kinetic equations that include electron-neutral and ion-neutral collisions as well as the effect of a static electric field. The dispersion properties of the waves and their spatial growth rate were measured and compared with theoretical values. The detection characteristic of Langmuir probes for ion-acoustic waves was studied in detail and a theoretical model for it is proposed. Spatial saturation of the instability level was observed and its magnitude was found to be consistent with the idea that saturation is produced by trapping of electrons in the potential of the waves. (Modified author abstract) GRA

N73-30708# Colorado Univ., Boulder. Dept. of Astro-Geophysics.
NONLINEAR WAVE OPTICS OF PARAMETRIC PUMP RADIATION IN AN INHOMOGENEOUS PLASMA Interim Report
Donald F. DuBois, Martin V. Goldman, and Dean McKinnis Mar. 1973 54 p refs
(Contract F44620-73-C-0003; AF Proj. 9751)
(AD-763736; CU-1004; AFOSR-73-1135TR) Avail: NTIS CSCL 20/9

The self-consistent propagation of an intense (pump) beam that excites a parametric decay instability is calculated for an inhomogeneous plasma. The authors generalize to an inhomogeneous plasma the nonlinear absorptive conductivity calculated according to several recent theories for the saturated electron ion-decay instability in an homogeneous plasma. Saturation of the nonlinear conductivity for strong pumping is taken into account. This model of the nonlinear absorption is added to the linear absorption, and the authors carry out the numerical solution of the resulting nonlinear wave equation for radiation propagating into a plane-layered inhomogeneous plasma. Application is made to the anomalous absorption of the modifier radiation in ionospheric modification experiments and to absorption of laser radiation in laser-produced plasmas. (Modified author abstract) GRA

N73-30709# Colorado Univ., Boulder. Dept. of Astro-Geophysics.
PARAMETRIC INSTABILITIES OF DAMPED MODES IN INHOMOGENOUS PLASMAS Interim Report
Donald F. DuBois and Edward A. Williams Apr. 1973 14 p refs
(Contract F44620-73-C-0003; AF Proj. 9751)
(AD-763737; CU-1005; AFOSR-73-1134TR) Avail: NTIS CSCL 20/9

Using WKB analysis it is shown that for three-wave back-scattering type parametric instabilities in inhomogeneous plasmas no spatial (convective) growth is possible for undamped modes. If one coupled mode is more heavily damped than the other, then spatial growth is possible in both forward and back-scattering. The spatial amplification factor is that obtained by Rosenbluth only if the pump power is sufficiently above a damping-determined threshold but below a threshold for temporal or absolute instability exists for the backscatter instabilities. For the parametric decay instability at (omega sub 0) = 2(omega sub pe) in a finite spatial region only a temporal instability is found but no spatial (convective) growth. Author (GRA)

N73-30710# New York Univ., N.Y. Dept. of Electrical Engineering and Computer Science.
ON THE THEORY OF PLASMA TURBULENCE
N. Marcuvitz Jun. 1973 47 p refs
(Contract N00014-67-A-0467-0018; NR Proj. 371-147)
(AD-763438; TR-402-13) Avail: NTIS CSCL 20/9

The nonlinear stochastic equations descriptive of a turbulent field belong to a class of perturbation problems that can be solved via the formal theory of scattering. With a proper choice of unperturbed operators, formally exact operator solutions can be derived and expanded into explicit, rapidly convergent, nonsecular representations of the fields and their transport properties. These results may be obtained via operator algebra or diagram methods, the former being preferred. The theory is illustrated for the case of a simple electron plasma wherein kinetic equations for particles and for waves are derived. The derivation appears to be analytically more transparent than that of Dupree's and has the virtue of exhibiting explicitly higher order terms, some of which are novel. Author (GRA)

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N73-30711 National Lending Library for Science and Technology, Boston Spa (England).
EFFECT OF LITHIUM FLUORIDE ON THE ELECTRICAL CONDUCTIVITY OF POLYCRYSTALLINE MAGNESIUM OXIDE
F. K. Volynetz, G. I. Dronova, and L. V. Udalova [1973] 6 p refs Transl. into ENGLISH from Izv. Akad. Nauk. SSR, Neorg. Mater. (USSR), v. 8, n. 2 p 391-392 In ENGLISH and RUSSIAN
(NLL-M-23040-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The dependence of the electrical conductivity on temperature of coil pressed samples of pure magnesium oxide, and with additions of lithium fluoride was investigated. The equations for describing the dependence of the electrical conductivity are given. It was found that the addition of lithium fluoride up to 1 wt produces a continuous increase in the electrical conductivity of the magnesium oxide. Further increase in the addition of lithium fluoride up to 7.5 wt does not change the value of the electrical conductivity. F.O.S.

N73-30712 Cornell Univ., Ithaca, N.Y.
STRUCTURE AND ENHANCED SUPERCONDUCTIVITY OF EVAPORATED ALUMINUM FILMS Ph.D. Thesis
Richard Bolton Pettit 1972 143 p
Avail: Univ. Microfilms Order No. 73-7145

The increase in the superconducting transition temperature of evaporated aluminum films is correlated with the average grain size, lattice constant, film thickness, and other structural properties. The transition temperature was determined by fitting the resistive transition to the theory of Aslamazov and Larkin, while the average grain size was determined from the width of the (111) diffraction ring. It was found that transition temperature is a function of the average grain size. The approximate 1/a (where a is the average gain size) dependence is in agreement with the theories of Hurautt and Garland et al., as modified by Watton. Both theories indicate that a change in the photon spectrum at the surface of the grain is responsible for the increase transition temperature. This size dependence is also in agreement with the experiments of Watton. It was found that there is an oxide layer surrounding each grain. Dissert. Abstr.

N73-30713 Georgia Inst. of Tech., Atlanta.
ELECTRICAL CONDUCTION IN NONDEGENERATE, NON-SYMMETRICAL, EPITAXIAL SEMICONDUCTING FILMS Ph.D. Thesis
Dale Wayne Covington 1972 136 p
Avail: Univ. Microfilms Order No. 73-6544

A theory is developed of electrical conduction in nondegenerate, single crystal, semiconducting films on insulating substrates which removes the limitation of symmetrical surface scattering and space charge layers. The theory is used to interpret the reported electrical properties of thin epitaxial germanium films. The results of a supplementary study of sputtered germanium and gallium arsenide films are also presented. The Boltzmann transport equation is solved using Fuchs' indices of surface scattering and space charge potentials computed by numerical integration of Poisson's equation. The derived distribution function is incorporated into an integral expression of hole and electron conduction as a function of film thickness and electrical surface parameters. Limiting forms of these general expressions are derived for the flat band condition and for extrinsic n- and p- type films. Dissert. Abstr.

N73-30714# Lockheed Missiles and Space Co., Palo Alto, Calif.
ABSORPTION OF Ba2NaNb5O15 CRYSTALS IN THE EXCITED STATE
V. A. Timoshenkov 1973 2 p refs Transl. into ENGLISH from Zh. Prikl. Spektroskopii, Akad. Nauk Belorussk. SSR. (Minsk), v. 18, no. 4, 1973 p 739-740
Avail: NTIS HC $3.00; Natl. Translations Center, John Crerar Library, Chicago, Ill. 60616

A study was made of the excited absorption spectra a Ba2NaNb5O15 crystal which is stable under intense laser exposure. The crystal also has good nonlinear properties. Results show that the optical properties of the crystal in the excited and unexcited states are analogous to the properties of LiNb03 crystal. Author

N73-30715*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPERIMENTAL INVESTIGATION OF RESONANCE SELF-SHIELDING AND THE DOPPLER EFFECT IN URANIUM AND TANTALUM Final Report
Tae Y. Byoun (Rensselaer Polytechnic Inst., Troy, N. Y.), R. C. Block (Rensselaer Polytechnic Ints., Troy, N. Y.), and T. T. Semler Jun. 1972 36 p refs Submitted for publication
(Grant NGR-33-018-134)
(NASA-TM-X-69565) Avail: NTIS HC $4.00 CSCL 20L

A series of average transmission and average self-indication ratio measurements were performed in order to investigate the temperature dependence of the resonance self-shielding effect in the unresolved resonance region of depleted uranium and tantalum. The measurements were carried out at 77 K, 295 K and approximately 1000 K with sample thicknesses varying from approximately 0.1 to 1.0 mean free path. The average resonance parameters as well as the temperature dependence were determined by using an analytical model which directly integrates over the resonance parameter distribution functions. Author

N73-30716# Communications Research Centre, Ottawa (Ontario).
THE EFFECT OF LASER-INDUCED THERMAL PULSES ON THE THRESHOLD VOLTAGE OF MOSFETS
R. H. Hum and A. L. Barry Jun. 1973 8 p refs
(CRC-1246) Avail: NTIS HC $3.00

The short term effect of a submillisecond laser pulse on the threshold voltage of metal oxide semiconductor field effect transistors was investigated, with negative results. This resolves a minor controversy over a paper presented at a recent radiation-effects conference. A novel method of measuring transient shifts in threshold voltage was developed. Author

N73-30717# National Bureau of Standards, Washington, D.C. Electronic Technology Div.
METHODS OF MEASUREMENT FOR SEMICONDUCTOR MATERIALS, PROCESS CONTROL, AND DEVICES Quarterly Report, 1 Jan. - 31 Mar. 1973
W. Murray Bullis, ed. Aug. 1973 79 p refs Sponsored in part by the Army, Navy, AF and AEC
(NBS-TN-788) Avail: SOD HC $0.95 as C13.46:788

Activities directed toward the development of methods of measurement for semiconductor materials, process control, and devices are reported. Significant accomplishments include: (1) development of a comprehensive, large area test pattern for evaluating planar junction structures, (2) completion of experimental work on the evaluation of the destructive, double-bond pull test for wire bonds, (3) initiation of scanning electron microscope facility, and (4) completion of the investigation of the mechanism of emitter-base junction reverse breakdown during rapid switching of transistors. Author

N73-30718# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.
STUDY OF THE BEHAVIOR OF CRYSTAL DEFECTS USING A MONTE-CARLO METHOD: APPLICATION TO QUENCH SIMULATION
J. M. Lanore Dec. 1972 15 p In FRENCH
(CEA-N-1567) Avail: AEC Depository Libraries HC $3.00

The program JERK, based on the Monte Carlo method is used to study the formation mechanism of cavities in irridiated metals. Several hypotheses for applying the program to quench simulation are given. Transl. by E.H.W.

N73-30719# General Electric Co., Schenectady, N.Y.
INTERACTION BETWEEN AMORPHOUS SEMICONDUCTOR THIN FILM AND ELECTRON BEAM Semiannual Technical Report, 1 Sep. 1972 - 31 May 1973

Arthur C. M. Chen 31 May 1973 30 p refs
(Contract DAHC04-72-C-0016; ARPA Order 1562)
(AD-763253; SRD-73-094; SATR-2) Avail: NTIS CSCL 20/12

The research program has been directed to obtaining a quantitative understanding of the electron beam recording and readout sensitivity characteristics of amorphous semiconductor thin films. The effort in measuring the electron beam readout sensitivity of various amorphous semiconductor thin films has been continued. The results on Ge15Te81As4 shows that contrary to earlier work, the crystalline phase has a higher secondary electron yield than the amorphous phase. A research effort to understand electron beam enhanced crystallization process in amorphous semiconductor thin film has been initiated. Some preliminary results on light effect on crystallization temperature are reported. The process and thickness dependence of crystallization temperature, T(x), in Ge-Te-As thin films is investigated. (Modified author abstract) GRA

N73-30720# Paris Univ. (France). Lab. d'Optique.
OPTICAL INVESTIGATION OF THE ELECTRONIC STRUCTURE OF BINARY ALLOYS: NOBLE METAL-NOBLE METAL ALLOYS Final Technical Report, Jan. - Dec. 1972
F. Abeles, J. Rivory, and M. L. Theye Jan. 1973 91 p refs
(Contract DAJA37-72-C-2039; DA Proj. 200-61102-B-11B)
(AD-763239; ARDG(E)-E-1484) Avail: NTIS CSCL 20/12

The report summarizes the results of optical investigations performed over a wide energy range of thin films of Au-Cu alloys in both disordered and ordered phases. The problems related to the preparation and the characterization of well-crystallized, completely disordered or ordered samples in the whole composition range are discussed. The optical data concerning both interband and intraband transitions are given for a variety of films, and discussed in some typical cases. These results are interpreted in the framework of new theoretical models proposed for the electronic band structure of disordered alloys, treated essentially in the coherent potential approximation. Ordering effects are considered. Author (GRA)

N73-30721# Sussex Univ., Brighton (England). School of Mathematical and Physical Sciences.
MAGNETIC AND TRANSPORT PROPERTIES OF DILUTE MAGNETIC ALLOYS Final Scientific report, Oct. 1967 - Dec. 1972
John W. Loram, Alexander D. C. Grassie, Gwyn Williams, Peter J. Ford, Geoffrey A. Swallow, Terence E. Whall, and Rodney J. White 20 Dec. 1972 124 p refs
(Contract F61052-68-C-0011; AF Proj. 7367)
(AD-763710; AFML-TR-73-141) Avail: NTIS CSCL 20/12

Measurements of the resistivity (0.4 to 300K), magnetic susceptibility (1.4 to 300K), magnetization and magnetoresistance (in applied magnetic fields up to 59kOe) have been made on the following alloy systems. CuFe, CuAuFe, AuTi, AuCr, AuMn, AuFe, AuCo, AuNi, PdMn, PdFe, PdCo, PtFe and PtCo. Four aspects of the properties were studied in detail. 1) The intrinsic properties of isolated impurities. These are discussed in terms of spin fluctuation or Kondo models. The sign of the magnetoresistivity and the temperature coefficient of the resistivity is explained on a phase shift model. The effect of interactions between impurities on their intrinsic properties. The nature and properties of the magnetically ordered state in more concentrated alloys. Deviations from Matthiessen's Rule in the resistivities of dilute alloys. (Modified author abstract) GRA

N73-30722# University of Southern Calif., Los Angeles. Electronic Sciences Lab.
GROWTH AND CHARACTERIZATION OF GaAs AND CHARACTERIZATION OF GaAs AND MIXED III-V SEMICONDUCTOR COMPOUNDS Ph.D. Thesis. Report for Jul. 1969 - Jun. 1973
Vincent F. S. Yip Jun. 1973 234 p refs
(Grant DAHC15-72-G-0007)
(AD-763761; USCEE-455) Avail: NTIS CSCL 20/2

Gallium arsenide crystals were grown 1 cm in diameter by the gradient freeze technique and by the travelling heater method (THM) using a gallium zone. Optimal conditions for THM with a 1 cm long resistance heater were determined to be a heater temperature of 900C, a lowering rate of 1.5 mm/day, a 6 to 10 mm long zone, a 1 cm long seed and a feed ingot over 2 mm long. Experimental results agreed well with a classical constitutional supercooling analysis. Preliminary experiments of THM growth of Ga(x)In(1-x)Sb and Ga(x)Al(1-x)As were also performed. Classical constitutional supercooling theory was extended to multicomponent systems. Author (GRA)

N73-30723# Pennsylvania Univ., Philadelphia. Lab. for Research on the Structure of Matter.
EPITAXIC SUBLIMATION METHODS FOR THE STUDY OF PSEUDO-BINARY SEMICONDUCTOR ALLOYS Progress Report, 1 Jun. 1971 - 31 May 1972
Jay N. Zemel 15 Sep. 1972 48 p refs
(Contract N60921-70-C-0251; ARPA Order 1597)
(AD-763488) Avail: NTIS CSCL 20/12

The parting layer and the hot wall techniques of epitaxic film growth have been extensively and successfully tested and are now in operation. The research on the PbO(x)S(1-x) has been extended to photoconductivity measurements. Use of modulation spectroscopy techniques for the study of the optical properties of the films was initiated and extensive thermoreflectance measurements were carried out on the IV-VI compounds and the resulting structures were identified with the critical points in their energy band structure. The surface wave studies have progressed with generation of 200 MHz Rayleigh waves using transducers of aluminum interdigital arrays on quartz. The experimental system for the physiochemical studies of PbS-PbO system was completed and a large number of kinetic studies were carried out. A full-relativistic APW program based on the Dirac's equation has been developed and successfully tested on SnTe. The calculation of the deformation potential for the extrema of the lead chalcogenides and SnTe was completed. GRA

N73-30724# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
STRUCTURAL PROPERTIES OF AMORPHOUS SEMICONDUCTORS BY MOSSBAUER SPECTROSCOPY Semiannual Technical Report No. 2
Norman Blum 31 May 1973 15 p refs
(Contract N00017-72-C-4401; ARPA Order 1562)
(AD-763408) Avail: NTIS CSCL 20/12

The amorphous to crystalline transition in vacuum deposited tellurium films has been observed using Mossbauer spectroscopy. Although the work is still preliminary, a large difference between the amorphous and crystalline forms of tellurium has been observed in the recoil free fraction as well as a smaller, but measurable, difference between the magnitudes of the quadrupole interactions. The samples studied contain 50% enriched tellurium-125 and are about 2 microns thick. Attempts to form thicker films have met with difficulties which may be overcome in further experiments. Thicker or higher enrichment films will result in better quality spectra which will be easier to analyze and interpret. GRA

N73-30725# Honeywell, Inc., Bloomington, Minn. Corporate Research Center.
RESEARCH ON TERNARY COMPOUND SEMICONDUCTORS FOR LONG-WAVELENGTH INFRARED DETECTION Final Report, 1 Apr. 1972 - 31 May 1973
M. Walter Scott Jun. 1973 50 p refs
(Contract N00014-72-C-0316; NR Proj. 015-241)
(AD-763466) Avail: NTIS CSCL 20/12

New ternary diamond-like semiconductors have been investigated as possible long wavelength infrared detector materials. Fifteen combinations from three different classes of compounds, A(II)B(IV)C2(V),A2(I)B(IV)C3(VI) and A3(I)B(V)C4 (VI), have been tried. Of these only six show any traces of a ternary compound having been formed, and only two of these, Cu2GeSe3 and Cu2SnSe3, can be grown for a melt. The energy gaps for these compounds were found to be 0.85 eV and 0.5 eV, respectively. The compounds ZnSnSb2 and Cu3SbSe4 form via peritectic reactions and thus require more elaborate crystal growth procedures. The energy gaps were found to be no greater than 1.0 eV for ZnSnSb2 and about 0.2 eV for Cu3SbSe4. Bandgaps for the remaining ternary compounds, Cu2GeTe3 and Cu3AsSe4, were not determined. All material produced was heavily doped p-type, p=10 to the 18th power/cc, probably due to stoichiometric defects. Author (GRA)

N73-30726# University of Southern Calif., Los Angeles. Electronic Sciences Lab.
EVALUATION OF GALLIUM NITRIDE FOR ACTIVE MICROWAVE DEVICES Annual Technical Progress Report, 1 Mar. 1972 - 31 Mar. 1973
Murray Gershenzon and H. S. Wing May 1973 11 p
(Contract N00014-67-A-0269-0024)
(AD-763413) Avail: NTIS CSCL 20/12

The study of the heterepitaxial growth of single crystal GaN was being undertaken both by open tube chemical vapor despotion and by organometal vapor transport growth. GaN thin film, deposited on (1,-1,0,2) sapphire, were typically transparent in color with the corresponding values of 0.15 mm thick (x 2 x 1 cm), 4 x 10 to the 18th power/cc carrier density and 90 sq. cm./v-sec mobility. Preliminary study for the drift velocity; and for good ohmic contacts and Schottky barrier materials were also made by I-V technique and photoresponse method.
Author (GRA)

N73-30727# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ADVANCED ELECTRONIC TECHNOLOGY Quarterly Technical Summary Report, 1 Feb. - 30 Apr. 1973
Melvin A. Herlin, Herbert G. Weiss, and Alan L. McWhorter 15 May 1973 28 p
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-763731; ESD-TR-73-61) Avail: NTIS CSCL 20/12

The Quarterly Technical Summary covers the period 1 February through 30 April 1973. It consolidates the reports of Division 2 (Data Systems), Division 4 (Air Traffic Control), and Division 8 (Solid State) on the Advanced Electronic Technology Program.
Author (GRA)

N73-30728# North Carolina Univ., Chapel Hill.
ELECTRONIC STATES IN DISORDERED MATERIALS Semiannual Technical Report, 1 Aug. 1972 - 31 Jan. 1973
M. Silver and K. S. Dy 31 Jan. 1973 12 p
(Grant DA-ARO(D)-31-124-71-G52; ARPA Order 1562)
(AD-763496) Avail: NTIS CSCL 20/12

The report discusses the tight-binding approach to calculating the density of states in amorphous covalently bonded semiconductors.
GRA

N73-30729# Radio Corp. of America, Princeton, N.J.
CONDUCTION MECHANISMS FOR ELECTRONIC DEVICES Final Report, 3 May 1972 - 2 May 1973
David Redfield Jun. 1973 32 p refs
(Contract N00014-71-C-0371)
(AD-763426; PRRL-73-CR-35) Avail: NTIS CSCL 20/12

Detailed measurements of the electronic transport properties in controlled-occupancy energy band tails have revealed unexpected new results which have significant implications for the understanding of disordered semiconductors. Foremost is the finding that at low temperatures (approximately - 20 K) the temperature dependence of the conductivity is accurately described by log sigma approximately equal to (T to the -1/2 power), not (T to the -1/4 power), as predicted by Mott and others. The only theory that does predict our result applies to one-dimensional, random, hopping conduction; not three. Since this is the first extensive test of these theories at the necessary low temperatures, serious questions of theoretical interpretation are raised. It is suggested that these results may be attributed to the filamentary character of electronic conduction paths in random potentials. The previously observed exponential dependence of conductivity on electric field strength has been found to extend to as low as 2 V/cm at 4.2 K and to have a sensitivity which increases further at lower temperatures. Measurements of the thermoelectric power at 5 to 10 K and at 77 K give somewhat inconsistent results; the 77 K data are in better agreement with expectations based on Fermi level shifts within the band tails.
Author (GRA)

N73-30894 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF SEMICONDUCTOR MATERIALS TECHNOLOGY
Bohdan Paszkowski *In its* Transl. on Eastern Europe, Sci. Affairs, No. 339 (JPRS-59617) 25 Jul. 1973 p 15-17 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 11-15 (For availability see N73-30893 21-34)

N73-30895 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF SEMICONDUCTOR TECHNOLOGY
Witold Rosinski *In its* Transl. on Eastern Europe, Sci. Affairs, No. 339 (JPRS-59617) 25 Jul. 1973 p 18-21 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 15-20 (For availability see N73-30893 21-34)

N73-30898 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF SEMICONDUCTOR OPTOELECTRONICS
Bohdan Mroziewicz *In its* Transl. on Eastern Europe, Sci. Affairs, no. 339 (JPRS-59617) 25 Jul. 1973 p 29-35 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 33-37 (For availability see N73-30893 21-34)

N73-30901 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF PIEZOELECTRONICS AND ACOUSTOELECTRONICS
Wincenty Pajewski *In its* Transl. on Eastern Europe, Sci. Affairs, No. 339 (JPRS-59617) 25 Jul. 1973 p 41-47 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 50-54 (For availability see N73-30893 21-34)

N73-30902 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF MAGNETICALLY SOFT FERRITE MATERIALS
Tomasz Postupolski *In its* Transl. on Eastern Europe, Sci. Affairs, No. 339 (JPRS-59617) 25 Jul. 1973 p 48-52 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 62-66 (For availability see N73-30893 21-34)

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N73-30730# Defence Standards Labs., Maribyrnong (Australia).
THE RAPID DETERMINATION OF DIPHENYLAMINE AND DINITROTOLUENE IN SINGLE BASE PROPELLANTS BY ULTRAVIOLET SPECTROPHOTOMETRY
R. G. Davidson and F. D. McPherson May 1973 10 p refs
(TM-51) Avail: NTIS HC $3.00

The simultaneous determination of diphenylamine and dinitrotoluene in propellants by ultraviolet spectrophotometry was found to give results comparable with those given by the standard chemical methods. The former method is quicker and does not require an experienced analyst.
Author

N73-30731# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Lampoldshausen (West Germany). Inst. fuer Chemische Raketenantriebe.
FLUORINE/AMMONIA: POSSIBILITY OF USE IN A TRANSFER STAGE AND PRELIMINARY EXPERIMENTAL EXPERIENCES [FLUOR/AMMONIAK: EINSATZMOEGLICHKEIT FUER EINE TRANSFERSTUFE UND ERSTE EXPERIMENTELLE ERFAHRUNGEN]
Werner Mueller Bonn Bundesmin. fuer Forsch. und Technol. Mar. 1973 54 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. und Technol.
(BMFT-FB-W-73-07) Avail: NTIS HC $4.75; ZLDI, Munich 10,95 DM

Among high energy bipropellants the volumic specific impulse of fluorine/ammonia is remarkably high due to its high average density. Advantages of fluorine/ammonia over other bipropellants, such as fluorine/hydrogen, used as rocket propellants are discussed. Used in a Europa 2 transfer stage, fluorine/ammonia would result in a geostational payload increase of 30%. Preflight tests carried out yielded efficiency factors of 90%. Preliminary experiments have also shown that the test engine operation is satisfactory.
Author (ESRO)

N73-30732# Utah Univ., Salt Lake City. Dept. of Civil Engineering.

THE MECHANICS OF MATERIALS WITH PERMANENT MEMORY, PART 1
Michael H. Quinlan and J. Edmund Fitzgerald Jul. 1973 88 p refs
(Contract N00014-67-A-0325-0001)
(AD-763753; UTEC-73-129-Pt-1) Avail: NTIS CSCL 21/9

The report deals with the stress constitutive problem for a class of materials typified by highly filled propellants. These materials exhibit both permanent and fading memory effects. The permanent memory effect is due to damage or microstructural weakening. A particular deformation history causes a certain damage. The stress response depends on this state of damage together with the deformation history itself. Introducing the idea of a damage functional, the stress response functional is assumed to depend on the history of that functional in addition to the deformation history itself. A topological structure is then built in which the stress response functional can be assumed continuous and differentiable. A Taylor series type expansion of the stress response functional is taken about the rest deformation and damage history. The topological structure leads to a Hilbert space in which a representation for the first order approximation is obtained. (Modified author abstract) GRA

N73-30733# California Inst. of Tech., Pasadena. Graduate Aeronautical Labs.
THE APPLICATION OF RATE THEORY TO THE FAILURE OF SOLID PROPELLANTS Final Report, 7 Dec. 1971 - 30 Apr. 1973
Gordon C. Smith, Karuppagounder Palaniswamy, and Wolfgang G. Knauss Jul. 1973 205 p refs
(Contract F04611-71-C-0027; AF Proj. 3059)
(AD-763806; GALCIT-SM-73-3; AFRPL-TR-73-54) Avail: NTIS CSCL 21/9

The process of failure accumulation in composite propellants was studied. One part of the study was concerned with the experimental tracing of void and microcrack formation. A second part dealt with the development of a physical model of microcrack growth in which cracks grow as a function of time and load history. The law for crack growth rate was based on the fracture mechanics of fracture in viscoelastic solids. Correlation of calculations and experiments on uniaxially strained tensile specimens in single loading-unloading cycles as well as repetitive load cycling (fatigue) showed that the model, though relatively simple when compared with the actual physical situation, is surprisingly accurate in representing the damage accumulated under strain. Damage was directly coupled with the constitutive behavior because the growth of flaws modified the propellant rigidity. Tests on cylinders under simultaneous tension and torque indicated that the failure process in this biaxial strain state loading is nearly the same as in the uniaxial strain state. Author (GRA)

N73-30734# Hamilton Standard, Windsor Locks, Conn.
MONOPROPELLANT HYDRAZINE TANK SELF-PRESSURIZER DEMONSTRATION PROGRAM Final Report
Eugene R. Bruun and Joseph E. Genovese Jun. 1973 201 p refs
(Contract F04611-72-C-0021)
(AD-763803; SVHSER-6049; AFRPL-TR-73-55) Avail: NTIS CSCL 21/9

The Hamilton Standard Division of United Aircraft Corporation has conducted an R and D program whose objective was the feasibility demonstration of a unique propellant tank pressurization concept based on surface tension feed of propellant to a reactor catalyst bed. The effort involved laboratory testing of wicking materials, subscale testing and a full scale breadboard system. A malfunction of the breadboard system occurred during test wherein an internal detonation caused damage to the hardware precluding further experimental activity. Subsequent to this malfunction, the program was redirected to formulate analytical models of the concept in an attempt to obtain better understanding of the physical mechanisms governing concept operation. (Modified author abstract) GRA

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magnetohydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N73-30735 Rolls-Royce, Ltd., Derby (England).
SOURCES OF NOISE IN AERO-ENGINES
D. A. A. Marshall 1972 25 p refs Presented at the 1st Intern. Symp. on Air Breathing Engines
Copyright. Avail: Issuing Activity

Aircraft engine noise sources and expected reduction in noise around airports with the use of high bypass ratio engines are discussed. The change from low to high bypass ratio has produced a marked noise reduction and character change transferring the dominance from jet noise with a low frequency roar to the fan, compressor, and turbine noise which are characterized by discrete tone and broadband noise of generally higher frequency than jet noise. To control and assess aircraft engine noise, single measurement units which allow regulatory action have been developed. Methods of conducting the acoustic measurements are described. Results of acoustic measurements are presented in graph form. Author

N73-30736# Detroit Diesel Allison, Indianapolis, Ind. Allison Div.
COLLECTION AND ASSESSMENT OF AIRCRAFT EMISSIONS BASE LINE DATA TURBOPROP ENGINES (ALLISON T56-A-15) Final Technical Report, 1 Jun. - 16 Aug. 1971
J. M. Vaught, W. M. Parks, S. E. J. Johnsen, and R. L. Johnson Sep. 1971 69 p refs
(Contract EPA-68-04-0029)
(EDR-7200) Avail: NTIS HC $5.50 CSCL 21E

Computerized data handling and statistical analysis programs were developed, exhaust emissions of eleven production T56-A-15 engines were measured, and a landing-takeoff emission test cycle was developed. Author

N73-30737*# Scientific Translation Service, Santa Barbara, Calif.
INVESTIGATION OF THE HEAT TRANSFER BETWEEN THE GAS AND CASING IN THE AREA OF THE INTER-VANE CHANNELS OF THE STATOR AND GUIDE VANES OF TURBINES
V. I. Lokay, M. N. Bodunov, V. A. Podgornov, and A. G. Karimova Washington NASA 3 Sep. 1973 12 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Aviats. Tekh. (Kazan), v. 15, no. 3, 1972 p 62-67
(Contract NASw-2483)
(NASA-TT-F-15051) Avail: NTIS HC $3.00 CSCL 21E

Heat transfer between a gas and a turbine casing in the intervane channels of stators and guide vanes is studied. Author

N73-30738*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONTROL OF A 30 cm DIAMETER MERCURY BOMBARDMENT THRUSTER
Fred F. Terdan and Robert T. Bechtel 1973 20 p refs Proposed for presentation at the 10th Elec. Propulsion Conf., Lake Tahoe, Nev., 31 Oct.-2 Nov. 1973; sponsored by AIAA
(NASA-TM-X-68297; E-7648) Avail: NTIS HC $3.00 CSCL 21C

Control logic functions were established for three automatic modes of operation of a 30-cm thruster using a power conditioner console with flight-like characteristics. The three modes provide: (1) automatic startup to reach thermal stability, (2) steady-state closed-loop control, and (3) the reliable recycling of the high voltages following an arc breakdown to reestablish normal operation. Power supply impedance characteristics necessary for stable operation and the effect of the magnetic baffle on the reliable recycling was studied. Author

N73-30739*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

INVESTIGATION OF HOLLOW CATHODE PERFORMANCE FOR 30-cm THRUSTERS

Michael J. Mirtich 1973 11 p refs Proposed for presentation at the 10th Elec. Propulsion Conf., Lake Tahoe, Nev., 31 Oct.-2 Nov. 1973; sponsored by AIAA

(NASA-TM-X-68298; E-7649) Avail: NTIS HC $3.00 CSCL 21C

A parametric investigation of 6.35 mm diameter mercury hollow cathodes was carried out in a bell jar. The parameters that were varied were the amount of initial emissive mix, insert position, emission current, cathode temperature, orifice diameter, and mercury flow rate. Flow characteristic curves and performance as a function of time were obtained for the various cathodes. The results of a 3880 hr life test of a main cathode run at 15 amps emission current with no noticeable changes in keeper and collector voltages are also presented. Author

N73-30740*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EXHAUST PRESSURE AND DENSITY OF VARIOUS PULSED MPD-ARC THRUSTER SYSTEMS

Charles J. Michels 1973 9 p refs Proposed for presentation at 10th Elec. Propulsion Conf., Lake Tahoe, Nev., 31 Oct. - 2 Nov. 1973; sponsored by AIAA

(NASA-TM-X-68299; E-7650) Avail: NTIS HC $3.00 CSCL 21C

Exhaust flow in a new, 155 cm i.d., vacuum facility was compared with earlier measurements in a small (15.2 cm i.d.) duct. Reductions in post transient impact pressure were about 5:1 in the larger facility. Corresponding reduced electron number densities (approximately 2 x 10 to the 13th power/cucm) were noted. A new, 125 miscrosecond, pulse forming network power source produced no major differences in impact pressure compared to the crowbarred condenser bank used earlier. Comparing a puff gas feed of the arc chamber with a new 10 millisecond steady gas feed also showed no major difference in impact pressure for 125 miscrosecond powering. Author

N73-30741*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A 9700-HOUR DURABILITY TEST OF A FIVE CENTIMETER DIAMETER ION THRUSTER

S. Nakanishi and R. C. Finke 1973 17 p refs Proposed for presentation at Propulsion Specialist Conf., Lake Tahoe, Nev., 29 Oct.-2 Nov. 1973

(NASA-TM-X-68284; E-7624) Avail: NTIS HC $3.00 CSCL 21C

A modified Hughes SIT-5 thruster was life-tested at the Lewis Research Center. The final 2700 hours of the test are described with a charted history of thruster operating parameters and off-normal events. Performance and operating characteristics were nearly constant throughout the test except for neutralizer heater power requirements and accelerator drain current. A post-shutdown inspection revealed sputter erosion of ion chamber components and component flaking of sputtered metal. Several flakes caused beamlet divergence and anomalous grid erosion, causing the test to be terminated. All sputter erosion sources were identified. Author

N73-30742*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SERT 2 HOLLOW CATHODE MULTIPLE RESTARTS IN SPACE

William R. Kerslake and Robert C. Finke 1973 11 p refs Proposed for presentation at the 10th Elec. Propulsion Conf., Lake Tahoe, Nev., 31 Oct.-2 Nov. 1973; sponsored by AIAA

(NASA-TM-X-68292; E-7638) Avail: NTIS HC $3.00 CSCL 21C

Future missions, both station keeping and primary electric propulsion, will require multiple thrust restarts after periods of inactivity from a few hours to over one year. Although not a part of the original SERT 2 (Space Electric Rocket Test) flight objective, the opportunity to demonstrate multiple cathode restarts in space became available following completion of thruster running. Both neutralizer and main cathodes of each flight thruster were restarted repeatedly following storage periods up to 490 days. No deterioration of cathode heaters was noted nor was any change required in starting voltages or currents. Author

N73-30743*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A HOLLOW CATHODE NEUTRALIZER FOR A 30-cm DIAMETER BOMBARDMENT THRUSTER

R. T. Bechtel 1973 14 p refs Proposed for presentation at the 10th Elec. Propulsion Conf., Lake Tahoe, Nev., 31 Oct. - 2 Nov. 1973; sponsored by AIAA

(NASA-TM-X-68291; E-7578) Avail: NTIS HC $3.00 CSCL 21C

Recent improvements in overall thruster performance have imposed new constraints on neutralizer performance. The use of compensated grid extraction system requires a reevaluation of neutralizer position. A series of tests were conducted to determine what effect neutralizer cathode geometry has on performance. The parameters investigated included orifice diameter and length, and cathode diameter. Similar tests investigated open and enclosed keeper geometries. Neutralizer position tests with compensated grids suggested positions approximately 10 cm from the accelerator and radially out of the beam envelope should result in satisfactory performance and long life. Operation at keeper current of 1.5 am resulted in lower total neutralizer power, the elimination of tip heater power, and suitable closed loop control of the neutralizer vaporizer. Author

N73-30744*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PERFORMANCE OF 30-cm ION THRUSTERS WITH DISHED ACCELERATOR GRIDS

Vincent K. Rawlin 1973 17 p refs Proposed for presentation at the 10th Elec. Propulsion Conf., Lake Tahoe, Nev., 31 Oct.-2 Nov. 1973

(NASA-TM-X-68294; E-7642) Avail: NTIS HC $3.00 CSCL 21C

Thirteen sets of dished accelerator grids were treated on five different 30 cm diameter bombardment thrusters to evaluate the effects of grid geometry variations on thruster discharge chamber performance. The dished grid parameters varied were: grid-to-grid spacing, screen and accelerator grid hole diameter, screen and accelerator open area fraction, compensation for beam divergence losses, and accelerator grid thickness. The effects on discharge chamber performance of main magnetic field changes, magnetic baffle current, cathode pole piece length and cathode position were also investigated. Author

N73-30745*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.

HIGH TIP SPEED FAN INLET NOISE REDUCTION USING TREATED INLET SPLITTERS AND ACCELERATING INLETS (QUIET ENGINE PROGRAM FAN C SCALE MODEL)

S. B. Kazin Aug. 1973 129 p refs

(Contract NAS3-12430)

(NASA-CR-121268; R72AEG336) Avail: NTIS HC $8.50 CSCL 21E

A series of inlet suppression tests were run on a supersonic tip speed fan which employed an acoustically treated cowl wall, treated splitters and elevated average throat Mach numbers in various combinations. Results show appreciable fan noise reductions at high fan speeds; 15-18 PNdB. On the basis of inlet total pressure recovery loss per PNdb of noise reduction, an inlet with no splitters produced the most efficient design. However, greater reduction in noise was achieved with one splitter in the inlet. It was also noted that moderate increases in inlet Mach number increased noise in the acoustically treated inlets and that Mach numbers in excess of 0.65 were required before net noise reduction was realized. Author

N73-30746# Detroit Diesel Allison, Indianapolis, Ind.

STOICHIOMETRIC GAS TURBINES DEVELOPMENT PROBLEMS

Harold E. Helms Jun. 1972 56 p refs Presented at 1st Intern. Symp. on Air Breathing Engines, Marseille, France, 19-23 Jun. 1972

(EDR-7460) Avail: NTIS HC $5.00

Successful turbine engine rigs were supported by hot cascades, aerodynamic cascades (rotating and stationary), combustor tigs, materials testing, and fabrication developments. Cooling air usage, the effect of cooling air on turbine efficiency, fabrication (materials) methods, and control (instrumentation)

techniques are the areas discussed and illustrated. Lamilloy, a pseudo-transpiring material,. is discussed. Data on Lamilloy construction, permeability, oxidation, physical properties, and turbine airfoils are shown. Author

N73-30747# Marquardt Corp., Van Nuys, Calif.
RECENT ADVANCES IN MIXED CYCLE ENGINE DESIGN AND APPLICATION
Arnold Brema 1972 25 p Presented at 1st Intern. Symp. on Air Breathing Engines, Marseille, 19-23 Jun. 1972
Avail: NTIS HC $3.25

The relative merits of various mixed cycle engines are reviewed and the impact on component choices of the application of the propulsion system is given. Emphasis is placed on the supercharged ejector ramjet system and its relative merit compared for advanced aircraft propulsion. The advantages of multi-mode operation of the propulsion system are outlined and critical component technologies are briefly reviewed. Author

N73-30748*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Mission Analysis Div.
SEP THRUST SUBSYSTEM PERFORMANCE SENSITIVITY ANALYSIS
K. L. Atkins, C. G. Sauer, Jr., and D. J. Kerrisk 15 Aug. 1973 61 p refs
(Contract NAS7-100)
(NASA-CR-133792; JPL-TM-33-611) Avail: NTIS HC $5.25 CSCL 21C

This is a two-part report on solar electric propulsion (SEP) performance sensitivity analysis. The first part describes the preliminary analysis of the SEP thrust system performance for an Encke rendezvous mission. A detailed description of thrust subsystem hardware tolerances on mission performance is included together with nominal spacecraft parameters based on these tolerances. The second part describes the method of analysis and graphical techniques used in generating the data for Part 1. Included is a description of both the trajectory program used and the additional software developed for this analysis. Part 2 also includes a comprehensive description of the use of the graphical techniques employed in this performance analysis.
Author

N73-30749*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRANSIENT ANALYSIS OF ENERGY TRANSFER CONTROL (ECT) AND COMPRESSOR BLEED CONCEPTS OF REMOTE LIFT FAN CONTROL
James F. Sellers Washington Sep. 1973 54 p refs
(NASA-TM-X-2863; E-7437) Avail: NTIS HC $3.50 CSCL 21E

The transient performance of two concepts for control of vertical takeoff aircraft remote lift fans is analyzed and discussed. Both concepts employ flow transfer between pairs of lift fans located in separate parts of the aircraft in order to obtain attitude control moments for hover and low-speed flight. The results presented are from a digital computer, dynamic analysis of the YJ97/LF460 remote drive turbofan. The transient responses of the two systems are presented for step demands in lift and moment. Author

N73-30750# British Aircraft Corp., Weybridge (England). Commercial Aircraft Div.
AN AIRCRAFT DESIGNER'S REVIEW OF SOME AIRFRAME AND ENGINE INTEGRATION CONCEPTS
P. R. G. Williams and D. J. Stewart 23 Jun. 1972 26 p refs Presented at 1st Intern. Symp. on Air Breathing Engines, Marseille, France, 19-23 Jun. 1972
Avail: NTIS HC $3.50

Attention was given to buried engines in the rear fuselage which ingest fuselage boundary layer air. It is shown that this type of integrated installation potentially offers significant improvements in overall performance, especially if cruise Mach numbers are to be increased into the high subsonic/transonic speed range. It is noted that in the application of boundary layer ingestion the realization of the potential gains and the engineering of the installation would be easier with an aft fan rather than a front fan engine. Author

N73-30751# Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).
PRACTICAL APPLICATION OF BOUNDARY LAYER THEORY TO FLOW AND HEAT TRANSFER PROBLEMS IN TURBOMACHINES
Dietmar K. Hennecke 1972 24 p refs Presented at 1st intern. Symp. on Air Breathing Engines, Marseille, 19-23 Jun. 1972
Avail: NTIS HC $3.25

A general computation method is outlined for the evaluation of the flow and heat transfer characteristics of turbomachinery blades. One of the elements of this procedure is an integral type boundary layer analysis which is described. It encompasses all important features of boundary layer flow at blades, i.e. laminar and turbulent flow regions with favorable and adverse pressure gradients, compressibility, shock waves, roughness, lateral convergence or divergence, heat transfer, temperature dependence of fluid properties, and injection of a secondary flow. Some illustrative results are presented graphically both for a compressor and turbine cascade. Author

N73-30752# Rolls-Royce, Ltd., Derby (England).
DEVELOPMENT OF THE OLYMPUS TURBOJECT TO MEET SUPERSONIC CIVIL TRANSPORT REQUIREMENTS
A. B. Street 1971 33 p ref Presented at the 1st Intern. Symp. on Air Breathing Engines, Marseille, 19-23 Jun. 1972
Avail: NTIS HC $3.75

Modifications to the Olympus turbojet engine are described that make it suitable for civil operation. The modifications to the following engine components are discussed: compressors, main shafts, bearing compartments, combustion system, turbine, and control system. Pollution control, servicing, and engine monitoring are also described. F.O.S.

N73-30753*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STEADY STATE ANALYSIS OF ENERGY TRANSFER CONTROL (ETC) AND COMPRESSOR BLEED CONCEPTS OF REMOTE LIFT FAN CONTROL
James F. Sellers Washington Sep. 1973 38 p refs
(NASA-TM-X-2876; E-7436) Avail: NTIS HC $3.00 CSCL 21E

Two new concepts of control for VTOL aircraft remote lift fans are analyzed and discussed. Both concepts employ flow transfer among lift fans located in separate parts of the aircraft in order to obtain attitude control moments in hover and low-speed flight. The results presented are from a digital computer analysis of the YJ97/LF460 remote drive turbofan, although qualitative conclusions should apply to any remote fan system. The basic operating principles of the two systems are described, and their steady-state moment generating capabilities are discussed. Lift-recovery strategies for component failures are also analyzed.
Author

N73-30754*# General Applied Science Labs., Inc., Westbury, N.Y.
A MATHEMATICAL MODEL FOR JET ENGINE COMBUSTOR POLLUTANT EMISSIONS Technical Report, 19 Jul. 1971 - 31 Jan. 1973
J. L. Boccio, G. Weilerstein, and R. B. Edelman Mar. 1973 106 p refs
(Contract NASw-2235)
(NASA-CR-121208; GASL-TR-781) Avail: NTIS HC $7.50 CSCL 21E

Mathematical modeling for the description of the origin and disposition of combustion-generated pollutants in gas turbines is presented. A unified model in modular form is proposed which includes kinetics, recirculation, turbulent mixing, multiphase flow effects, swirl and secondary air injection. Subelements of the overall model were applied to data relevant to laboratory reactors and practical combustor configurations. Comparisons between the theory and available data show excellent agreement for basic CO/H2/Air chemical systems. For hydrocarbons the trends are predicted well including higher-than-equilibrium NO levels within the fuel rich regime. Although the need for improved accuracy in fuel rich combustion is indicated, comparisons with actual jet engine data in terms of the effect of combustor-inlet temperature is excellent. In addition, excellent agreement with

data is obtained regarding reduced NO emissions with water droplet and steam injection. Author

N73-30755# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Lampoldshausen (West Germany). Inst. fuer Chemische Raketenantriebe.
CALCULATION OF WALL AND COOLANT TEMPERATURES OF REGENERATIVELY COOLED ROCKET ENGINES
Josef Reinkenhof 13 Apr. 1972 45 p refs In GERMAN; ENGLISH summary
(DLR-FB-72-29) Avail: NTIS HC $4.25; DFVLR, Porz, West Ger. 14,30 DM

A differential equation for the temperature of the coolant flow was derived. The temperature distribution in the wall is given as a polynomial function. The temperature dependence of the heat conductivity of the wall material was taken into account. Dimensionless heat transfer equations were used for local heat transfer coefficients. The temperature field necessary for the design of regeneratively cooled expansion nozzles was calculated discontinuously from a solution of this differential equation. The calculation method is applied to a LO2/LH2-high-pressure rocket engine. Author (ESRO)

N73-30756# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SHUTTERLESS PULSO-RAMJET ENGINE
Werner Eick 7 Jun. 1973 15 p refs Transl. into ENGLISH from Flug-Rev. Int. (West Germany), no. 8, 1972 p 27-31
(AD-763173; FTD-HC-23-468-73) Avail: NTIS CSCL 21/5

The report describes the development of a transonic jet engine that has the capability of ingesting air without the aid of a compressor. GRA

N73-30757# Naval Air Engineering Center, Philadelphia, Pa. Ground Support Equipment Dept.
OPTIMAL ENGINE SELECTION FOR GROUND SUPPORT EQUIPMENT Progress Report, Jul. 1972 - Jun. 1973
William H. Womer and Peter B. Zacharkiw Jun. 1973 59 p refs
(AD-763663; NAEC-GSED-66) Avail: NTIS CSCL 21/7

A comprehensive study was conducted to review the state-of-the art of new prime movers and to determine if they could be applied to present or future ground support equipment (GSE). This investigation included a discussion of existing GSE prime mover requirements and the problems that they encounter. Author (GRA)

N73-30758# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
ALTITUDE TESTING OF THE AEROJET AJ10-179 LIQUID ROCKET ENGINE Final Report, Jul. 1970 - Jun. 1972
Robert A. Jamieson Mar. 1973 107 p refs
(AF Proj. 3059)
(AD-763727; AFRPL-TR-72-128) Avail: NTIS CSCL 21/8

Three flightweight Aerojet AJ10-179 engine assemblies were tested under vacuum conditions. The testing had two objectives. First was demonstration that the engine could meet the requirements of a Ballistic Missile Post Boost Propulsion System with N2O4-N2H4 as the propellants. The second was measurement and evaluation of the engine's capability to perform pulsing missions, such as a space maneuvering mission, using N2O4-MMH as the propellants. Injector erosion was encountered in 3 of 5 tests using MMH. Higher gas temperatures, less cooling capability and possible combustion roughness caused higher heat loads which produced the erosion. (Modified author abstract) GRA

N73-30759# Westinghouse Research Labs., Pittsburgh, Pa. Combustion Systems Research Group.
INVESTIGATION OF CORROSION-DEPOSITION PHENOMENA ON GAS TURBINE BLADES Final Report
L. R. Fleisher 1973 40 p refs
(Contract EPA-68-03-0049)
(PB-221095/3; EPA-6702-73-06) Avail: NTIS HC $3.75

The resistance of gas turbine components to the corrosive environment expected in a power plant fueled with shredded refuse was questioned. Corrosion tests were run at conditions simulating those expected from the interfacing of a fluidized bed refuse combustor with current state-of-the-art gas turbines. (Modified author abstract) GRA

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics, and 24 Physics, Atomic, Molecular, and Nuclear.

N73-30760 National Lending Library for Science and Technology, Boston Spa (England).
NEW DATA ON THE TIDAL NATURE OF DISTURBANCES IN THE SUN'S ACTIVITY
I. V. Maksimov and N. P. Smirnov [1972] 19 p refs Transl. into ENGLISH from Tr. Arkt. Antarkt. Nauc.-Issled. Inst. (Leningrad), no. 302 1971 p 26-38
(NLL-M-23039-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons CSCL 03B

Verification of Brown's hypothesis about the tidal origin of disturbances in the sun's activity is studied. Climatological observations of regions of the earth with respect to time were used. The existance of a complex system of tidal forces on the sun, created by all planets in the solar system, is confirmed. J.A.M.

N73-30761*# Arizona Univ., Tucson.
COMMUNICATIONS OF THE LUNAR AND PLANETARY LABORATORY, VOLUME 9, PART 3
G. P. Kuiper, ed. and Micheline Wilson, ed. 1972 44 p refs
(Grant NGL-03-002-002)
(NASA-CR-133826; LC-62-63619) Avail: NTIS HC $4.25 CSCL 03B

Arizona-NASA atlas of infrared solar spectrum, map of the galactic nucleus at 10 microns, optical seeing tests at Mt. Lemmon, and sulfuric acid in Venus clouds are presented. Spectral albedos and narrow-band photometry of the Galilean satellites are also included. For individual titles, see N73-30762 through N73-30767.

N73-30762* Arizona Univ., Tucson.
ARIZONA-NASA ATLAS OF THE INFRARED SOLAR SPECTRUM, REPORT 10
D. C. Benner, G. P. Kuiper, L. Randic, and A. B. Thomson *In its* Commun. of the Lunar and Planetary Lab., Vol. 9, Pt. 3 1972 p 155-169 (For availability see N73-30761 21-29)
(Grant NGR-03-002-091)
(LPL-Commun-166) CSCL 03B

The Arizona-NASA Infrared Solar Spectrum Atlas is concluded. The wavelength interval covered is 13350-34100 A. Author

N73-30763* Arizona Univ., Tucson.
NARROW-BAND PHOTOMETRY OF THE GALILEAN SATELLITES c14
Willem Wamsteker *In its* Commun. of the Lunar and Planetary Lab., Vol. 9, Pt. 3 1972 p 171-177 refs (For availability see N73-30761 21-29)
(LPL-Commun-167) CSCL 14E

Observations were made of the Galilean satellites in a narrow-band photometric system with a resolution of approximately 30 that covers the wavelength range from 0.3-1.1 microns. The absolute scale of the system is determined from stellar model computations. It is concluded that 35 Leo, the main comparison star used, has an energy distribution similar to the sun. An attempt is made to interpret the albedo curves in terms of surface constituents. Author

N73-30764* Arizona Univ., Tucson.
SPECTRAL ALBEDOS OF THE GALILEAN SATELLITES
Thomas Lee *In its* Commun. of the Lunar and Planetary Lab., Vol. 9, Pt. 3 1972 p 179-180 refs (For availability see N73-30761 21-29)
(Grant NGR-03-002-180)
(LPL-Commun-168) CSCL 03B

The wavelength dependence of the albedo of the Galilean

satellites was determined from wide-band photometric observations extending from 0.36 microns to 3.4 microns. Author

N73-30765* Arizona Univ., Tucson.
MAP OF THE GALACTIC NUCLEUS AT 10 MICRONS c30
G. H. Rieke and F. J. Low *In its* Commun. of the Lunar and Planetary Lab., Vol. 9, Pt. 3 1972 p 181-183 refs (For availability see N73-30761 21-29)
(LPL-Commun-169) CSCL 03B

The galactic nucleus was mapped at 10 microns with a resolution of a few arc seconds. Four discrete sources were resolved superimposed on an extended background. Author

N73-30766* Arizona Univ., Tucson.
PRELIMINARY REPORT ON OPTICAL SEEING TESTS AT MT. LEMMON, MARCH - JUNE 1971 c20
George V. Coyne *In its* Commun. of the Lunar and Planetary Lab., Vol. 9, Pt. 3 1972 p 185-189 refs (For availability see N73-30761 21-29)
(LPL-Commun-170) CSCL 04B

One of the Lick Observatory Polaris telescopes was used to test seeing conditions at Mt. Lemmon. The preliminary results indicate that the seeing is not unlike that at Kitt Peak. Soundings of the air flow patterns across Mt. Lemmon under winter conditions were also made by flying smoke pots on tethered ballons to elevations of 500 feet. There does not appear to be any serious local turbulence. Author

N73-30767* Arizona Univ., Tucson.
SULFURIC ACID IN THE VENUS CLOUDS c30
Godfrey T. Sill *In its* Commun. of the Lunar and Planetary Lab., Vol. 9, Pt. 3 1972 p 191-198 refs (For availability see N73-30761 21-29)
(LPL-Commun-171) CSCL 03B

The visible and ultraviolet transmission features of a thin layer of elemental bromine and hydrobromic acid dissolved in sulfuric acid somewhat resemble the Venus spectrum, up to 14 microns. The chemical process postulated for forming sulfuric acid involves the oxidation of sulfur and its compounds to sulfuric acid through the agency of elemental bromine, produced by the photolytic decomposition of hydrogen bromide. Author

N73-30768*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CONSISTENCY OF COSMIC-RAY SOURCE ABUDANCES WITH EXPLOSIVE NUCLEOSYNTHESIS
B. Kozlovsky and R. Ramaty Aug. 1973 14 p refs
(NASA-TM-X-70448; X-660-73-237) Avail: NTIS HC $3.00 CSCL 03B

A model was examined in which the cosmic ray abundances of elements from C to Fe are consistent with explosive nucleosynthesis. The observed abundance of cosmic rays near the earth, cosmic ray source abundance, and solar system abundance are discussed along with the ratios of cosmic ray sources to the solar system abundances. F.O.S.

N73-30769*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN EMPIRICAL MODEL OF ENERGETIC SOLAR PROTON FLUXES WITH APPLICATIONS TO EARTH ORBITING SPACECRAFT
E. G. Stassinopoulos and J. H. King Dec. 1972 33 p refs Submitted for publication
(NASA-TM-X-70433; X-601-72-489) Avail: NTIS HC $3.75 CSCL 03B

An empirical model for energetic solar proton fluxes is presented. With this model, the effects of such protons on geocentric space missions, to be flown during the next solar active period (1966-1983) and with orbits involving partial magnetospheric shielding, may be estimated. A synoptic background review is given, followed by a detailed discussion of the model's analytic development. Also given are comments on the model's use, errors, uncertainties, and limitations, including sample calculations which demonstrate the application of specific or general project missions. Finally, for circular trajectories, percentage exposure maps are presented, depicting fractional mission times spent outside particular L-shells as functions of orbit altitude and inclination. Author

N73-30770*# General Electric Co., Schenectady, N.Y. Physics and Electrical Engineering Lab.
LUNAR SURFACE COSMIC RAY EXPERIMENT S-152, APOLLO 16 Final Report
R. L. Fleischer, H. R. Hart, Jr., M. Carter, G. M. Comostock, A. Renshaw, and R. T. Woods 25 Jul. 1973 67 p refs
(Contract NAS9-11468)
(NASA-CR-134019) Avail: NTIS HC $5.50 CSCL 03B

This investigation was directed at determining the energy spectra and abundances of low energy heavy cosmic rays (0.03 E or = 150 MeV/nucleon). The cosmic rays were detected using plastic and glass particle track detectors. Particles emitted during the 17 April 1972 solar flare dominated the spectra for energies below about 70 MeV/nucleon. Two conclusions emerge from the low energy data: (1) The differential energy spectra for solar particles vary rapidly for energies as low as 0.05 MeV/nucleon for iron-group nuclei. (2) The abundance ratio of heavy elements changes with energy at low energies; heavy elements are enhanced relative to higher elements increasingly as the energy decreases. Galactic particle fluxes recorded within the spacecraft are in agreement with those predicted taking into account solar modulation and spacecraft shielding. The composition of the nuclei at energies above 70 MeV/nucleon imply that these particles originate outside the solar system and hence are galactic cosmic rays. Author

N73-30771# National Research Council of Canada, Ottawa (Ontario).
SOLAR ACTIVITY AND MANIFESTATIONS IN THE BIOSPHERE
M. N. Gnevyshev and K. F. Novikova 1973 11 p Transl. into ENGLISH from Zemlya Vselennaya (Moscow), v. 4, 1971 p 33-36
(NRC-TT-1679) Avail: NTIS HC $3.00

The effects of solar activity on the biosphere are investigated. Data cover correlations between indices of activity and biological indices, as well as methods for analyzing such indices. Several approaches including superimposed epochs, a simple method of comparing average data on diseases obtained during geomagnetically active and quite periods, and comparing the average data on diseases during days with various levels of geomagnetic activity. Author

N73-30772# National Environmental Satellite Service, Washington, D.C.
OPERATIONAL PROCESSING OF SOLAR PROTON MONITOR DATA
Louis Rubin, Henry L. Phillips, and Stanely R. Brown Aug. 1973 20 p refs
(NOAA-TM-NESS-49) Avail: NTIS HC $3.00

Operational processing of data is described from the solar proton monitor sensor flown on environmental satellites of TIROS (television infrared observation satellite) series named ITOS (improved TIROS operational satellite). Hardware systems aboard the ITOS are discussed, and the software procedures relevant to the data recovery, recording, and transmission problems are described. Included are descriptions of tape formats, message formats, data location procedures, data frame contents, and a partial index of processed data available in archival form. Author

N73-30773*# Stanford Univ., Calif. Inst. for Plasma Research.
INFLUENCE OF SOLAR MAGNETIC SECTOR STRUCTURE ON TERRESTRIAL ATMOSPHERE VORTICITY Scientific Interim report
John M. Wilcox, Philip H. Scherrer, Leif Svalgaard, Walter Orr Roberts (Univ. Corp. for Atmospheric Res.), Roger H. Olson (NOAA), and Roy L. Jenne (Natl. Center for Atmospheric Res.) Jul. 1973 33 p refs
(Grant NGR-05-020-559; Contract N00014-67-A-0112-0068; Grant NSF GA-31138; NR Proj. 323-003)
(NASA-CR-133842; SUIPR-530) Avail: NTIS HC $3.75 CSCL 03B

The solar magnetic sector structure has a sizable and

reproducible influence on tropospheric and lower stratospheric vorticity. The average vorticity during winter in the Northern Hemisphere north of 20 deg N latitude reaches a minimum approximately one day after the passing of a sector boundary, and then increases during the following two or three days. The effect is found at all heights within the troposphere, but is not prominent in the stratosphere, except at the lower levels. No single longitudinal interval appears to dominate the effect.
Author

N73-30774*# Stanford Univ., Calif. Inst. for Plasma Research.
SOLAR ACTIVITY AND THE WEATHER
Leif Svalgaard Jun. 1973 25 p refs Presented at the 7th ESLAB Symp., Saulgau, W. Germany, 22-25 May 1973
(Grant NGR-05-020-559; Contract N00014-67-A-0112-0068; Grant NSF GA-31138)
(NASA-CR-133850; SUIPR-526) Avail: NTIS HC $3.25 CSCL 03B

Some evidence that the weather is influenced by solar activity is reviewed. It appears that the solar magnetic sector structure is related to the circulation of the earth's atmosphere during local winter. About 3 1/2 days after the passage of a sector boundary the maximum effect is seen: apparently the height of all pressure surfaces increases in high latitudes leading to anticyclogenesis, whereas at midlatitudes the height of the pressure surfaces decreases leading to low pressure systems or to deepening of existing systems. This later effect is clearly seen as an increase in the area of the base of air with absolute vorticity exceeding a given threshold. Since the increase of geomagnetic activity generally is small at a sector boundary, it is speculated that geomagnetic activity as such is not the cause of the response to the sector structure, but that both weather and geomagnetic activity are influenced by the same (unknown) mechanism.
Author

N73-30775*# Hale Observatories, Pasadena, Calif. Big Bear Solar Observatory.
SUNSPOT MOTION AND FLARING IN M482
B. Lazareff and H. Zirin [1971] 18 p refs
(Contract NSR-05-002-071; Grant NSF GA-24015)
(NASA-CR-133848; BBSO-0130) Avail: NTIS HC $3.00 CSCL 03B

A series of flares was studied in McMath 11482 August 19-22, 1971, with particular reference to the basis for the flares and comparison with dekameter radio data. The flares were produced by rapid (approximately 1000 km/hr) westward motion of a large new p spot. Many flares occur just in front of the spot, and they cease when the motion stops. All flares occuring in front of the spot produce type III bursts, while even strong flares elsewhere in the region produce little or no type III. The time of type III emission agrees perfectly with the start of the H alpha flare. Thus type III bursts are only produced in favorable configurations. Simultaneous K-line movies are compared with H alpha films and show little difference in flare appearance.
Author

N73-30776*# Maryland Univ., College Park. Inst. for Fluid Dynamics and Applied Mathematics.
STABILIZATION OF ELECTRON STREAMS IN TYPE 3 SOLAR RADIO BURSTS
K. Papadopoulos, M. L. Goldstein, and R. A. Smith May 1973 31 p refs
(Grant NGR-21-002-005)
(NASA-CR-133844; BN-770) Avail: NTIS HC $3.75 CSCL 03B

It is shown that the electron streams that give rise to Type 3 solar radio bursts are stable and will not be decelerated while propagating out of the solar corona. The stabilization mechanism depends on the parametric oscillating two stream instability. Radiation is produced near the fundamental and second harmonic of the local electron plasma frequency. Estimates of the emission at the second harmonic indicate that the wave spectra created by the oscillating two stream instability can account for the observed intensities of Type 3 bursts. Author

N73-30777# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
QUASI-LINEAR APPROACH FOR BOUNCE AND DRIFT RESONANCE INTERACTIONS OF TRAPPED PARTICLES IN THE MAGNETOSPHERE
T. Ishihara (Tokyo Univ.) and T. Tamao Apr. 1973 26 p refs
(TRITA-EPP-73-09) Avail: NTIS HC $3.50

Quasi-linear diffusion equations for the hybrid interaction between the bound and drift resonances of trapped particles with random field fluctuations were considered for cases of both electrostatic and electromagnetic disturbances. In addition to the usual diffusion term, there is a friction term for particle transport in the case of electromagnetic fluctuations. The stochastic interaction due to the bouncing motion decreases the diffusion coefficient, which is an appreciable effect for fluctuations with long wavelength along the field line. The combination of the expression found for the diffusion coefficient with Mozer's power spectrum of random electric field in the magnetosphere yields a large transport coefficient leading to deep penetration of particles into the magnetosphere.
ESRO

N73-30778# Lund Univ. (Sweden). Dept. of Physics.
PHOTOMETRIC MEASUREMENTS ON TRACKS OF VERY HEAVY COSMIC RAY PARTICLES WITH E > 1 GeV/ NUCLEON
R. Andersson, L. Larsson, and O. Mathiesen Feb. 1973 89 p refs Sponsored in part by the Swed. Atom Res. Council and the Swed. Nat. Res. Council
(LUIP-CR-73-02) Avail: NTIS HC $6.50

About 120 primary cosmic ray particles with Z number between 16 and 28 at energies higher than 1 GeV/nucleon were identified, by photometric measurements of a high altitude balloon-borne nuclear emulsion stack. The basic quantity used for charge identification is the track width. For nonrelativistic particles, observation of the track width rate of change is required. Sources of error are discussed, with emphasis on the track width rate of change, and a statistical model of error analysis is presented. The method is sensitive to emulsion irregularities, and correct identification requires flat tracks through many emulsions. A charge distribution is presented exhibiting a considerable nonrelativistic content. No complete resolution between consecutive charges was obtained.
ESRO

N73-30779# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
GEOPHYSICS AND SPACE DATA BULLETIN, VOLUME 10, NO. 1, FIRST QUARTER 1973
Anne L. Carrigan, ed. Jun. 1973 330 p refs
(AF Proj. 8666)
(AD-763507; AFCRL-TR-73-0340; AFCRL-SR-160) Avail: NTIS CSCL 03/2

The Bulletin is a quarterly publication that contains AFCRL contract and in-house data reported from sites throughout the world. Program descriptions for all data sections are updated annually or as required, and are presented in Number 1 of each volume. The following types of data are contained within each issue: magnetometer, cosmic ray, ELF noise, riometer, solar optical and radio emission, and ionosonde. This issue covers such data for January, February, and March 1973. (Modified author abstract)
GRA

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N73-30780 National Lending Library for Science and Technology, Boston Spa (England).
A COMPARISON OF SOME CHARACTERISTICS OF CLUSTER AND FIELD GALAXIES
A. V. Zasov Jul. 1973 3 p refs Transl. into ENGLISH from Astron. Tsirk. (USSR), no. 520, 1969 p 1-3
(NLL-RTS-8000) Avail: Natl. Lending Library, Boston Spa, Engl.: 40p or 1 NLL photocopy coupon

The color index of various galaxies is compared. Data analysis

of galaxies composing pairs indicates that in color and density that they are practically indistinguishable from single galaxies. The different conditions of galaxy formation in clusters and fields are also examined. J.A.M.

N73-30781 Texas Univ., Austin.
A PRELIMINARY MORPHOLOGIC STUDY OF THE LUNAR SURFACE Ph.D. Thesis
Peter Hewlett Schultz 1972 975 p
Avail: Univ. Microfilms Order No. 73-7640

Lunar Orbiter photographs reveal a wide variety of surface features that are classified, illustrated, and interpreted. The shapes in plan of lunar craters describe typical geometries and indicate a variety of processes that influence craters in different size ranges. Floor, wall, and rim features reflect different origins and modifications, and these features are arranged and discussed separately in selected size ranges for crater diameters from approximately 0.1 km to greater than 100 km. A reference for comparisons between the lunar surface and other planetary bodies is also included. Dissert. Abstr.

N73-30782 California Inst. of Tech., Pasadena.
APERTURE SYNTHESIS OF INTERSTELLAR NEUTRAL HYDROGEN IN ABSORPTION Ph.D. Thesis
Eric Winslow Greisen 1973 414 p
Avail: Univ. Microfilms Order No. 73-7290

The Owens Valley Radio Observatory interferometer has been used to carry out a program of aperture synthesis in the interstellar neutral hydrogen line. Maps having resolutions of 1 kHz and about 1.3 arc minutes were produced using a novel Fourier inversion procedure. The equipment, observing procedure, noise, and gaussian analysis of spectra are also treated. The Perseus arm feature in the spectrum of Cygnus A is of low optical depth but reveals considerable spatial structure. The data suggest that the hydrogen is located in a thin shell expanding at 2 km/sec, with a radius around 9.7 parsecs and a total mass of 175 solar masses. The Perseus arm feature in the spectrum of Cassiopeia A contains very large amount of hydrogen with extremely complicated spatial structure. Dissert. Abstr.

N73-30783*# Techtran Corp., Glen Burnie, Md.
METHODS OF INVESTIGATING VARIABLE STARS
V. B. Nikonov Washington NASA Jul. 1973 255 p refs Transl. into ENGLISH of the publ. "Metody Issledovaniya Peremennykh Zvezd" Moscow, Nauka, 1971 334 p
(Contract NASw-2037)
(NASA-TT-F-797) Avail: NTIS HC $6.35

A collection of nine articles, devoted mainly to the modern methodology used in studying variable stars is presented.

N73-30784* Techtran Corp., Glen Burnie, Md.
DISCOVERY OF VARIABLE STARS
N. Ye. Kurochkin *In its* Methods of Investigating Variable Stars (NASA-TT-F-797) Jul. 1973 p 1-29 refs Transl. into ENGLISH from the publ. "Metody Issledovaniya Peremennykh Zvezd" Moscow, Nauka, 1971 p 11-48 (For availability see N73-30783 21-30)
CSCL 03A

Instrumented methods of discovering variable stars are reviewed, specifically the blink comparator, color contrast method, positive-negative method, and television method. Among the empirical methods discussed, the Van Gent method is the most important. Author

N73-30785* Techtran Corp., Glen Burnie, Md.
VISUAL ESTIMATES OF BRIGHTNESS AND ANALYSIS OF OBSERVATIONS OF VARIABLE STARS
V. P. Tsesevich *In its* Methods of Investigating Variable Stars (NASA-TT-F-797) Jul. 1973 p 30-63 refs Transl. into ENGLISH from the publ. "Metody Issledovaniya Peremennykh Zvezd" Moscow, Nauka, 1971 p 49-90 (For availability see N73-30783 21-30)
CSCL 03A

Methods of visual estimation of the brightness of variable stars include the Argelander method, Pickering method, and Neyland-Blazhko method. Systematic errors are discussed together with methods of plotting brightness curves. Author

N73-30786* Techtran Corp., Glen Burnie, Md.
PHOTOGRAPHIC PHOTOMETRY OF VARIABLE STARS c14
P. N. Kholopov *In its* Methods of Investigating Variable Stars (NASA-TT-F-797) Jul. 1973 p 64-84 refs Transl. into ENGLISH from the publ. "Metody Issledovaniya Peremennykh Zvezd" Moscow, Nauka, 1971 p 91-116 (For availability see N73-30783 21-30)
CSCL 14E

Photographic methods of determining stellar magnitude and measuring brightness of variable stars on negatives include the photoelectric method and the contascope. Calibration curves are usually plotted by the UBV method. Magnitudes of comparison stars can be determined from photographs. Author

N73-30787* Techtran Corp., Glen Burnie, Md.
METHODS OF PHOTOELECTRIC OBSERVATIONS
P. F. Chugaynov *In its* Methods of Investigating Variable Stars (NASA-TT-F-797) Jul. 1973 p 85-123 refs Transl. into ENGLISH from the publ. "Metody Issledovaniya Peremennykh Zvezd" Moscow, Nauka, 1971 p 117-166 (For availability see N73-30783 21-30)
CSCL 03A

Photoelectric detectors and their operation are described, with emphasis on photomultipliers, infrared radiation detectors, and photoelectric photometers.

N73-30788* Techtran Corp., Glen Burnie, Md.
USE OF PHOTOELECTRONIC IMAGE FORMATION DEVICES (ELECTRON PHOTOGRAPHY, ELECTRON OPTICAL CONVERTERS, TELEVISION) c14
V. V. Prokofyeva *In its* Methods of Investigating Variable Stars (NASA-TT-F-797) Jul. 1973 p 124-145 refs Transl. into ENGLISH from the publ. "Metody Issledovaniya Peremennykh Zvezd" Moscow, Nauka, 1971 p 167-198 (For availability see N73-30783 21-30)
CSCL 14E

Electronic image amplification methods are used in variable star observations to increase significantly the volume of recorded information. Electronic cameras are the most efficient, while television cameras increase contrast of weak stars against the background of the sky. Author

N73-30789* Techtran Corp., Glen Burnie, Md.
METHODS OF STUDYING POLARIZATION OF VARIABLE STAR RADIATION
N. M. Shakhovskoy *In its* Methods of Investigating Variable Stars (NASA-TT-F-797) Jul. 1973 p 146-166 refs Transl. into ENGLISH from the publ. "Metody Issledovaniya Peremennykh Zvezd" Moscow, Nauka, 1971 p 199-224 (For availability see N73-30783 21-30)
CSCL 03A

Polarized light from variable stars can be used to determine radiation intensity and wavelength. Various types of polarization analyzers are discussed (single-beam and double-beam) as well as their modes of use (continuous and discrete). Modulation of polarizers and determination of measurement accuracy are also covered. Author

N73-30790* Techtran Corp., Glen Burnie, Md.
PHOTOMETRIC SYSTEMS c14
V. L. Straizius *In its* Methods of Investigating Variable Stars (NASA-TT-F-797) Jul. 1973 p 167-205 refs Transl. into ENGLISH from the publ. "Metody Issledovaniya Peremennykh Zvezd" Moscow, Nauka, 1971 p 225-279 (For availability see N73-30783 21-30)
CSCL 14E

Stroemgren's classification of photometric systems is used to survey wideband, medium, and narrow-band systems for studying variable stars. Multicolor photometry of variable stars is used to obtain curves of brightness change and to study the physical properties of the variables as they change during alteration of brightness. Author

N73-30791* Techtran Corp., Glen Burnie, Md.
PHOTOMETRIC STANDARDS c14
A. S. Sharov *In its* Methods of Investigating Variable Stars (NASA-TT-F-797) Jul. 1973 p 206-225 refs Transl. into

ENGLISH from the publ. "Metody Issledovaniya Peremennykh Zvezd" Moscow, Nauka, 1971 p 280-306 (For availability see N73-30783 21-30)
CSCL 14E

Problem solving by means of photometric standards is discussed in the light of its application to variable star observations. The North Polar Sequence is covered in detail from both historical and functional standpoints, as are the so-called Kapteyn Areas and Harvard Standard Areas. Author

N73-30792* Techtran Corp., Glen Burnie, Md.
DETERMINATION OF PERIODS OF CHANGE IN BRIGHTNESS FOR VARIABLE STARS BY THE AID OF DIGITAL COMPUTERS
P. N. Kolopov *In its* Methods of Investigating Variable Stars (NASA-TT-F-797) Jul. 1973 p 226-245 refs Transl. into ENGLISH from the publ. "Metody Issledovaniya Peremennykh Zvezd" Moscow, Nauka, 1971 p 307-329 (For availability see N73-30783 21-30)
CSCL 03A

Computer techniques used for determination of periods of brightness change in variable stars are discussed, with emphasis on the Lafler-Kinman method and a presentation of Kholopov's own method based on brightness extremes. Author

N73-30793# Joint Publications Research Service, Arlington, Va.
STUDIES OF EARTH FROM SPACE
V. Sevastyanov 17 Aug. 1973 10 p Transl. into ENGLISH from Nauka i Zhizn' (Moscow), no. 5, 1973 p 8-12
(JPRS-59831) Avail: NTIS HC $3.00

A conversation is reported with V. Sevast'yanov, hero of the Soviet Union, USSR pilot-cosmonaut and candidate of technical sciences on the prospects of studying earth from outer space. Author

N73-30794# Joint Publications Research Service, Arlington, Va.
DATA ON ILLUMINATION IN THE ATMOSPHERE AND ON THE SURFACE OF VENUS OBTAINED BY THE AUTOMATIC INTERPLANETARY STATION VENERA-8
V. S. Avduyevskiy, M. Ya. Marov, B. Ye. Moshkin, and A. P. Ekonomov 5 Sep. 1973 6 p ref Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 210, no. 4, 1973 p 799-802
(JPRS-59963) Avail: NTIS HC $3.00 CSCL 03B

Results of direct measurements of illumination in the atmosphere and on the surface of the planet Venus during the flight of the automatic interplanetary station Venera-8 are given. Author

N73-30795*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE SHUTTLE RENDEZOUS, RADIATION AND REENTRY ANALYSIS CODE
Dave M. McGlathery 16 May 1973 93 p refs
(NASA-TM-X-64768) Avail: NTIS HC $6.75 CSCL 22C

A preliminary space shuttle mission design and analysis tool is reported emphasizing versatility, flexibility, and user interaction through the use of a relatively small computer (IBM-7044). The Space Shuttle Rendezvous, Radiation and Reentry Analysis Code is used to perform mission and space radiation environmental analyses for four typical space shuttle missions. Included also is a version of the proposed Apollo/Soyuz rendezvous and docking test mission. Tangential steering circle to circle low-thrust tug orbit raising and the effects of the trapped radiation environment on trajectory shaping due to solar electric power losses are also features of this mission analysis code. The computational results include a parametric study on single impulse versus double impulse deorbiting for relatively low space shuttle orbits as well as some definitive data on the magnetically trapped protons and electrons encountered on a particular mission. Author

N73-30796*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXPECTED GAMMA-RAY EMISSION SPECTRA FROM THE LUNAR SURFACE AS A FUNCTION OF CHEMICAL COMPOSITION
R. C. Reedy (Calif. Univ., La Jolla), J. R. Arnold (Calif. Univ., La Jolla), and J. I. Trombka Feb. 1973 66 p refs
(Contract NAS9-10670)
(NASA-TM-X-70453; X-641-73-88) Avail: NTIS HC $5.50
CSCL 03B

The gamma rays emitted from the moon or any similar body carry information on the chemical composition of the surface layer. The elements most easily measured are K, U, Th and major elements such as O, Si, Mg, and Fe. The expected fluxes of gamma ray lines were calculated for four lunar compositions and one chondritic chemistry from a consideration of the important emission mechanisms: natural radioactivity, inelastic scatter, neutron capture, and induced radioactivity. The models used for cosmic ray interactions were those of Reedy and Arnold and Lingenfelter. The areal resolution of the experiment was calculated to be around 70 to 140 km under the conditions of the Apollo 15 and 16 experiments. Finally, a method was described for recovering the chemical information from the observed scintillation spectra obtained in these experiments. Author

N73-30797*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE DAYSIDE MIDLATITUDE PLASMA TROUGH
Nathan J. Miller Jul. 1973 25 p refs Submitted for publication
(NASA-TM-X-70436; X-621-73-181) Avail: NTIS HC $3.25
CSCL 03B

The electrostatic probe experiment aboard the ISIS-1 satellite detects a quasi-stable dayside plasma trough in the protonosphere with a characteristic time of at least 2 weeks. This behavior contrasts with measurements at 1000 km from Explorer-22, which indicate a trough of a characteristic time less than a satellite orbit period. Associated with the protonospheric trough is an electron temperature maximum approximately 6000 K that is sharp at midnight and broad at noon. In spring and summer, a second noontime temperature maximum often appears poleward of 70 invariant latitude, accompanied by an enhancement in the ionization. The ISIS-1 data indicates that local processes such as dayside F-region photoionization and ionization by energetic cusp particles produce enhancements in plasma density and electron temperature. These enhancements modify the plasmaspheric boundary to varying degrees along a magnetic field tube, thus leading to a plasmas pheric boundary with distinctive features at various positions along a field tube. Author

N73-30798*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FEASIBILITY OF MINING LUNAR RESOURCES FOR EARTH USE: CIRCA 2000 AD. VOLUME 1: SUMMARY
Kenji Nishioka, Roger D. Arno, Arthur D. Alexander, and Robert E. Slye Aug. 1973 49 p refs 2 Vol.
(NASA-TM-X-62267) Avail: NTIS HC $4.50 CSCL 03B

The feasibility of obtaining lunar minerals for terrestrial uses is examined. Preliminary results gave indications that it will not be economically feasible to mine, refine, and transport lunar materials to Earth for consumption. A broad systems approach was used to analyze the problem. It was determined that even though the procedure was not economically advisable, the concept for the operations is technically sound. Author

N73-30799*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FEASIBILITY OF MINING LUNAR RESOURCES FOR EARTH USE: CIRCA 2000 AD. VOLUME 2: TECHNICAL DISCUSSION
Kenji Nishioka, Roger D. Arno, Arthur D. Alexander, and Robert E. Slye Aug. 1973 161 p refs 2 Vol.
(NASA-TM-X-62268) Avail: NTIS HC $10.25 CSCL 03B

The technologies and systems required to establish the mining base, mine, refine, and return lunar resources to earth are discussed. Gross equipment requirements, their weights and costs are estimated and documented. The operational requirements are analyzed and tabulated. Diagrams of equipment and processing facilities are provided. Author

N73-30800*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MISSION PLANNING FOR PIONEER SATURN/URANUS

ATMOSPHERIC PROBE MISSIONS
Byron L. Swenson, Edward L. Tindle, and Larry A. Manning Washington Sep. 1973 20 p refs
(NASA-TM-X-2824; A-4934) Avail: NTIS HC $2.75 CSCL 22A

Mission planning for a series of atmospheric probe missions to Saturn and Uranus using a modified Pioneer spacecraft launched in 1979 and 1980 was examined. The operational options and the associated systems requirements consistent with the major scientific goals and spacecraft constraints of the missions is summarized. It is feasible to obtain in-situ atmospheric measurements in the atmosphere of Saturn and Uranus down to a pressure level of 10 bars using a common probe and spacecraft design. Spacecraft can be launched to both objectives with an adequate launch window in 1979 and 1980 using a Titan/Centaur launch vehicle with a TE-364-4 upper stage. Other scientific objectives can be accomplished by the flyby spacecraft. Encounters with the satellite Titan and RF occultations of Saturn, the ring system of Saturn, and Uranus can be obtained. Author

N73-30801*# Techtran Corp., Silver Spring, Md.
FOR LUNAR ROCK
V. Alekseyev, L. Lebedev, and G. S. Narimanov, ed Washington NASA Sep. 1973 119 p Transl. into ENGLISH of the publ. "Za Lunnym Kammem" Moscow, Mashinostr., 1972 120 p (Contract NASw-2485)
(NASA-TT-F-14983) Avail: NTIS HC $8.00 CSCL 03B

A discussion is reported of the spaceflights by Soviet devices to the moon and the results of the research which they carried out on the lunar surface. The work performed by the Lunokhod-1 is described and the results of an analysis of the samples of lunar rock brought back to earth by the Luna-16 are presented. Data are included on the flight of the Luna-20 station which brought material from the lunar mountains. Author

N73-30802# Specola Vaticana (Vatican City).
VV 428-479 VARIABLE STARS IN A CEPHEUS-LACERTA FIELD OF THE MILKY WAY Ricerche Astronomiche, Vol. 8, No. 18
Walter J. Miller (Fordham Univ.) and Arthur A. Wachmann (Hamburg Obs.) 1973 42 p
Avail: NTIS HC $4.25

Fifty-two variable stars (fourteen of which are already suspected variables whose types and/or light elements were hitherto unknown) were discovered and processed on Castel Gandolfo plates. Nine tables of data identification charts, light curves, and notes on each variable star are included. Author

N73-30803# Royal Greenwich Observatory, Herstmonceux (England).
LINE STRENGTHS IN THE SPECTRA OF SEVEN DOUBLE-LINED Am BINARY STARS
D. J. Stickland 1972 41 p refs
(Bull-177) Avail: NTIS HC $4.25; Royal Greenwich Observatory 60p

The equivalent width data for both components of seven double-lined spectroscopic binary (SB2) stars and two metallic-line A type (Am) stars are presented. The properties of the Am stars are reviewed and a procedure for the analysis of Am SB2 spectra is outlined. author

N73-30804*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EMPLACEMENT OF THE CAYLEY FORMATION
Verne R. Oberbeck, Friedrich Hoerz, Robert H. Morrison, and William L. Quaide Sep. 1973 54 p refs
(NASA-TM-X-62302) Avail: NTIS HC $4.75 CSCL 03B

Analysis of the effects of ejection of materials from large lunar craters, photogeologic evidence, remote measurements of surface chemistry and petrology of lunar samples are synthesized. Previous theories for emplacement of the Cayley are volcanic ash emplacement and emplacement as ejecta from multiringed basins. Calculations show that materials ejected beyond the continuous deposits of large lunar craters produce secondary impact craters that excavate and deposit masses of local material equal to multiples of the crater ejecta deposited at the same place. It is shown that the main influence of a large cratering event on terrain at distances greater than 50 km from large lunar craters is one of cratering and deposition of local material by secondary craters rather than deposition of ejecta from the large crater. Author

N73-30805*# Stanford Univ., Calif.
PROJECT CYCLOPS: A DESIGN STUDY OF A SYSTEM FOR DETECTING EXTRATERRESTRIAL INTELLIGENT LIFE
[1971] 253 p refs
(Grant NGT-05-020-409)
(NASA-CR-114445) Avail: NTIS HC $14.75 CSCL 03B

Results are reported of the study to determine the requirements for detecting the existence of extrasolar system life. Topics discussed include: life in the universe, methods of contact, communication by electromagnetic waves, signal acquisition, Cyclops system, antennas, receivers, signal processing, and search strategy. Conclusions of the study are included along with recommendations for future efforts. F.O.S.

N73-30806*# General Electric Co., Schenectady, N.Y. Physics and Electrical Engineering Lab.
INVESTIGATIONS OF LUNAR MATERIALS Final Report, 1 Feb. - 31 Jul. 1973
R. L. Fleischer and H. R. Hart, Jr. 31 Jul. 1973 17 p refs (Contract NAS9-11583)
(NASA-CR-134023; SRD-73-126) Avail: NTIS HC $3.00 CSCL 03B

In the particle track work, a series of dating techniques for learning about the surface history of soil and rock samples was developed. The surface behavior and history of diverse lunar rocks and soils, erosion rates, and deposition rates were studied, along with incident heavy cosmic ray spectrum. Author

N73-30807*# National Aeronautics and Space Administration, Washington, D.C.
LIFE BEYOND EARTH AND THE MIND OF MAN Symposium Proceedings (Abridged)
Richard Berendzen, ed. 1973 110 p Symp. held in Boston, 20 Nov. 1972
(NASA-SP-328; LC-73-600150) Avail: NTIS MF $1.45; SOD HC $1.25 Domestic Postpaid or $1.00 GPO Bookstore CSCL 03B

A symposium is reported on the implications of the possibility of extraterrestrial life for social, philosophical, and humanistic impacts. The viewpoints from astronomers, biologists, physicists, anthropologists, and theologians are given. Costs involved for finding this life are discussed along with the possible benefits to society. The direct implications from radio telescopes, the Pioneer 10 plaque, and discussions between the panelists are also reported. T.M.R.

N73-30808*# RAND Corp., Santa Monica, Calif.
MARINER 9 CONTROL NET OF MARS, APRIL 1973
Merton E. Davis Apr. 1973 73 p refs Sponsored in part by NASA Prepared for JPL
(Contract JPL-953011)
(NASA-CR-133845; R-1266-JPL) Avail: NTIS HC $5.75 CSCL 08B

A planet-wide geodetic control net of Mars that is based on the Mariner 9 television pictures has been in the process of being computed since January 1972. Results of the computations as of April 1973 are presented. Areocentric and areographic coordinates of 1340 control points have been computed using 613 frames and are presented tabularly. These coordinates will be revised as additional points and frames are added to the computation in the future. Author

N73-30809*# Stanford Univ., Calif. Radioscience Lab.
RESEARCH AT THE STANFORD CENTER FOR RADAR ASTRONOMY Semiannual Status Report, 1 Jul. - 31 Dec. 1972
Feb. 1973 51 p refs
(Grant NGL-05-020-014; SEL Proj. 3208)
(NASA-CR-133856; SASR-20) Avail: NTIS HC $4.25 CSCL 03A

Research is reported into the physical phenomena of space and planetary environments, and related applications of the techniques of radio science and technology. Reports presented include: studies of refraction, scintillation and retardation effects;

bistatic radar; radar studies of planetary atmospheres; ionospheric scintillation; magnetospheric radio noise emission; Helmholtz waves in the boundary layer; and Bragg scatter probing of sea state. A list is included of recent publications. F.O.S.

N73-30810*# Kansas State Univ., Manhattan. Dept. of Physics.
INFRARED LABORATORY STUDIES OF SYNTHETIC PLANETARY ATMOSPHERES Semiannual Status Report, 1 Dec. 1972 - 31 May 1973
Dudley Williams 14 Jun. 1973 45 p refs
(Grant NGR-17-001-026)
(NASA-CR-133855) Avail: NTIS HC $4.25 CSCL 03B

Previous research dealing with telluric gases is briefly reviewed. Current research concerning absorption-line broadening, and particulate constituents of planetary atmospheres are discussed. Two articles are included: optical constants of liquid ammonia in the infrared, and broadening of infrared absorption lines at reduced temperatures for nitrous oxide. F.O.S.

N73-30811# Universidad Nacional de Cordoba (Argentina).
ANNULAR ECLIPSE OD THE SUN OF 4 JANUARY 1973
G. M. Iannini and A. Niell 1972 20 p In SPANISH
(NP-19597) Avail: AEC Depository Libraries

The partial annular eclipse in Argentina of 4 January 1973 is reported. Tables showing the beginning, maximum, and termination of the eclipse for different locations are included along with maps indicating the path of the eclipse across Argentina. Transl. by F.O.S.

N73-30812# Paris Univ., Orsay (France).
EXPERIMENTAL AND SEMI-EMPIRICAL STUDY OF THE SPALLATION OF LIGHT NUCLEI. APPLICATION TO THE NUCLEOSYNTHESIS OF Li, Be, AND B IN THE GALAXY Ph.D. Thesis
M. ReyCampagnolle-Epherre 1972 102 p refs In FRENCH
(FRNC-TH-333) Avail: AEC Depository Libraries HC $7.25

Nuclear reactions likely to occur in the formation of Li, Be, and B by the interaction of galactic cosmic radiation with interstellar gas were studied in the laboratory. In cosmic radiation and the interstellar medium, hydrogen nuclei represent about 90% of the atoms present, and helium atoms, about 10%. The formation of Li, Be, and B in the spallation reactions induced by alpha particles and protons was studied. The formation cross sections of Li-6, Li-7, Be-7, Be-10, and Be-11, produced by the interaction of 160-MeV alpha particles with oxygen were measured. The formation cross sections for Be-7 and C-11 in nitrogen irradiated with 6- to 40-MeV protons were measured together with the Li-7/Li-6 (1.2 + or - 0.2) spallation ratio at 50 MeV. In order to complete the results, different models for estimating the cross sections for targets having mass numbers between 12 and 30 were studied. A computer simulation of a two-stage spallation model was utilized. Author (NSA)

N73-30813# Paris Univ., Orsay (France).
DETERMINATION OF VERY SMALL QUANTITIES OF RARE EARTHS IN TERRESTRIAL ROCK SAMPLES (BCRI) AND LUNAR ROCK SAMPLES (APOLLO 14) USING MASS SPECTROMETRY
G. Puil 1972 46 p refs In FRENCH
(FRNC-TH-335) Avail: NTIS Avail: AEC Depository Libraries; HC $4.50

A very sensitive method for the accurate determination of very small quantities of rare earth elements contained in rock samples was developed. Improvements were made to the isotopic dilution method using thermionic source mass spectrometry. High sensitivity was obtained by reducing the pollution due to natural elements with the utilization of a more suitable chemical separation technique. The accuracy of the method was increased by obtaining pure mass spectra and diminishing sources of error such as those due to mass discrimination and the lack of purity of the labeling compounds. In order to fulfill this requirement, the labeling substances were calibrated. The rare earths contained in basaltic rock (B.C.R.I.) and the lunar sample 14305 brought back from the Apollo 14 mission were determined. The results obtained confirm a very significant absence of Eu in relation to other rare earths. This phenomenon is due to the reduction of Eu(3+) to the Eu(2+) state, which enables this element to preferentially concentrate in the plagioclase during the fractional crystallization and/or partial melting of the lunar surface. NSA

N73-30814# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Mathematische Verfahren.
A METHOD FOR COMPUTING COPLANAR TRANSFERS IN A NEWTONIAN CENTRAL FORCE FIELD
Hellmuth Sommer 1973 47 p refs In GERMAN; ENGLISH summary
(DLR-FB-73-29) Avail: NTIS HC $4.50; DFVLR, Porz, West Ger. 12 DM

The coplanar transfers considered in a Newtonian central force field consist of two propulsive phases applying constant tangential thrust and one intermediate coast phase. For the determination of the coast phase, it is convenient to choose the specific total energy and the specific angular momentum as variables in computing the propulsive phases. In this case, a special method of piece-wise analytical integration of the equations of motion can be used to obtain highly accurate results by relatively little computational effort. As an example, the transfer from a circular orbit at a 200-km altitude about the earth to a 24-hr circular orbit was calculated utilizing electrical propulsion.
Author (ESRO)

N73-30815# Technische Hochschule, Munich (West Germany). Inst. fuer Raumfahrttechnik.
INVESTIGATIONS OF THE MANEUVERABILITY OF REENTRY BODIES [UNTERSUCHUNGEN ZUR MANOEVRIERFAEHIGKEIT VON WIEDEREINTRITTSKOERPERN]
Alwin Suess Bad Godesberg, West Ger. Bundesmin. fuer Bildung und Wiss. May 1972 114 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-W-72-15) Avail: NTIS HC $7.75; ZLDI, Munich 23.60 DM

Reentry trajectories of a semiballistic vehicle and a lifting body were calculated with optimizing and nonoptimizing programs. Rotation of the earth, reentry place and direction, and the influence of viscosity on the aerodynamic parameters above 50 kilometers were included. The results show the influence of reentry place and direction on the cross range of the vehicle. Using an additional program, other parameters were calculated, such as the waiting time of the satellite in orbit if maneuverability of the satellite is given, and the necessary cross range of the satellite if the maximum number of parking orbits is given. The program also permits choosing the optimal landing sites from a group of available ones. Author (ESRO)

N73-30816# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Flugfunk und Mikrowellen.
OBSERVATIONS ON THE GERMAN RESEARCH SATELLITE 625-A1, AZUR, (69971, GRS-A) TO DETERMINE ITS DEVIATION IN TIME [BEOBACHTUNGEN AM DEUTSCHEN FORSCHUNGSSATELLITEN 625-A1, AZUR, (69971 GRS-A) ZUR BESTIMMUNG DES ZEITFEHLERS]
W. Splechtna Bad Godesberg, West Ger. Bundesmin. fuer Bildung und Wiss. May 1972 81 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-W-72-18) Avail: NTIS HC $6.25; ZLDI, Munich 16.60 DM

During the period 24 April to 28 June, 1970, the topocentric positions of the German Research Satellite, 69971 GRS-A (625-A1, AZUR) were measured from ground station Weilheim-Lichtenau (Z-DBS) and recorded during 326 passages in order to gather data concerning the satellite's deviation in time. At every passage observed, a deviation in the time was found, sometimes of considerable amount but never exceeding certain limits so that the automatic control of the station would not be upset. No irregularities as might be caused by solar activities could be identified. The deviation in time could be derived from some errors of the orbital elements involved. During the first half of the period of observations the deviation in time seemed to oscillate systematically about the mean course of its values.
Author (ESRO)

N73-30817# Osservatorio Astronomico, Rome (Italy).
SOLAR PHENOMENA Monthly Bulletin, Oct. 1972

Massimo Cimino Oct. 1972 14 p
(Bull-174) Avail: NTIS HC $3.00

Solar data for Oct. 1972 are presented. Tables include: daily total areas of sunspot groups; heliographic position, classification and area of sunspot groups; longitudinal sunspot magnetic fields, and hours of K-line cinematographic patrol.
ESRO

N73-30818# Osservatorio Astronomico, Rome (Italy).
SOLAR PHENOMENA Monthly Bulletin, Nov. 1972
Massimo Cimino Nov. 1972 9 p
(Bull-175) Avail: NTIS HC $3.00

Solar data for November 1972 are presented. Tables include: daily total areas of sunspot groups; heliographic position, classification and area of sunspot groups; longitudinal sunspot magnetic fields, and hours of K-line cinematographic patrol.
ESRO

N73-30819# Royal Greenwich Observatory, Herstmonceux (England).
LINE STRENGTHS IN THE SPECTRA OF SEVEN DOUBLE-LINED Am BINARY STARS
D. J. Strickland Aug. 1972 41 p refs
(Roy-Obs-Bull-177) Avail: NTIS HC $4.25; Roy. Greenwich Obs., Herstmonceux, Engl. £0.60

The equivalent width data for both components of seven double-lined spectroscopic binary (SB2)stars and two metallic-line A type (Am) stars are presented. The properties of the Am stars are reviewed, and a procedure for the analysis of Am SB2 spectra is outlined. Author (ESRO)

N73-30820# Royal Greenwich Observatory, Herstmonceux (England). Time and Latitude Service.
GREENWICH TIME REPORT Quarterly Report, Jul. - Sep. 1972
Sep. 1972 17 p
Avail: NTIS HC $3.00

Greenwich time and latitude observations for July through September 1972 are presented. Radio time signals and standard frequency emissions are included. ESRO

N73-30821# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
THE ORBIT OF THE MOON Final Report, 1 Oct. 1969 - 31 Dec. 1972
Irwin I. Shapiro and Martin A. Slade Mar. 1973 288 p refs
(Contract F19628-70-C-0009; AF Proj. 8607)
(AD-761651; AFCRL-TR-73-0133) Avail: NTIS CSCL 03/3

The position of the moon as a function of time has been calculated very precisely using numerical integration techniques. The initial conditions for the moon's orbit was determined from a combination of radar, optical, and spacecraft observations relating to the moon's motion. Over 200 years of data were included. (Modified author abstract) GRA

N73-30822# Illinois Univ., Urbana. Coordinated Science Lab.
PULSAR ELECTRODYNAMICS Ph.D. Thesis
Satoshi Hinata May 1973 73 p refs
(Contract DAAB07-72-C-0259)
(AD-761883; R-607; UILU-ENG-73-2209) Avail: NTIS CSCL 03/2

It is usually assumed that the pulsar atmosphere consists of an open and a closed magnetosphere. There is, however, no generally accepted theory which predicts the boundary between these two regions. Contrary to expectation that the inertial effects would play the crucial role in determining this boundary, the author obtained the critical radius (R sub c) = (Omega R/C) sub (-2/5)R beyond which the lines of force are open, from the analysis of a corotational atmosphere, which is valid only in the absence of the inertial effects. The author also intends to clarify some of the processes underlying the theory of pair production and subsequent radio wave emission about a pulsar, as set forth by Sturrock. (Modified author abstract) GRA

N73-30823# Cornell Univ., Ithaca, N.Y. Center for Radiophysics and Space Research.
THE FAR INFRARED AND SUBMILLIMETER BACKGROUND
James R. Houck, Baruch T. Soifer, Martin O. Harwit, and Judith L. Pipher 1 Sep. 1972 22 p refs
(Contract F19628-70-C-0128; ARPA Order 1366)
(AD-763139; AFCRL-72-0616) Avail: NTIS CSCL 03/2

The authors repeat earlier observations of the infrared and submillimeter background radiation. While the measured values of the infrared background radiation remain unchanged, the high flux previously reported for the 0.4 to 1.3 mm range was not observed. This indicates that the flux cannot have been galactic or cosmic, but further observations are needed to rule out a solar cycle dependent geocoronal origin. Author (GRA)

N73-30824# Owens Valley Radio Observatory, Pasadena, Calif.
A SEARCH FOR DEUTERIUM RECOMBINATION LINE EMISSION FROM ORION A
Diego A. Cesarsky 1973 14 p refs
(Contract N00014-67-A-0094-0019; Grant NSF GP-304)
(AD-762001; Rept-1973-10) Avail: NTIS CSCL 03/2

Line emission from DCN was recently detected in the direction of the Orion Nebula. If DCN and HCN are formed and destroyed at the same rate, the D to H ratio is 0.006. This ratio should result in a detectable recombination line of deuterium. The author searched unsuccessfully for the D92 alpha line and placed a limit (D)/(H) = 0.0016. The present results suggest that HCN and its isotope have different rates of formation and destruction. Author (GRA)

N73-30825# Owens Valley Radio Observatory, Pasadena, Calif.
OBSERVATIONS OF RECOMBINATION LINE EMISSION IN THE DIRECTION OF TWO SUPERNOVA REMNANTS (2)
Diego A. Cesarsky and Catherine J. Cesarsky 1973 15 p refs
(Contract N00014-67-A-0094-0019; Grant NSF GP-30400; NSF GP-23780)
(AD-762002; Rept-1973-11) Avail: NTIS CSCL 03/2

Recombination line emission were detected in the direction of the supernova remnant 3C391 at 18 cm and 21 cm and in the direction of remnant 3C398 at 21 cm. The spectrum of 3C391 shows three emission features, one of which may be due to carbon recombination emission. The spectrum of 3C398 shows a hydrogen line at the same radial velocity as a recently reported carbon line in the same general direction. The observations suggest that the line emission originates in the cold component of the interstellar medium. (Modified Author Abstract) GRA

N73-30826# California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
THE HIGH ENERGY PROTON RADIATION BELT
R. Stephen White 22 Jan. 1973 87 p refs
(Contract N00014-69-A-0200-5001; NR Proj. 387-047)
(AD-763433; IGPP-UCR-73-4) Avail: NTIS CSCL 04/1

The experiments and theories to explain the high energy protons trapped in the earth's radiation belt are reviewed. The theory of cosmic ray albedo neutron decay injection of protons into the radiation belt is discussed. Radial diffusion and change in the earth's dipole moment are included along with losses of protons by ionization and nuclear collision. It is found that the measured albedo neutron escape current is sufficient to supply trapped protons above 30 MeV. The theoretical calculations of the trapped protons are in agreement with the measurements for L>or = 1.7 both on and off the equator. While it appears that diffusion of solar wind protons is responsible for most of the portons less than 30 MeV, additional measurements of the angular distributions and fluxes of low energy neutrons are required to determine the contributions of the cosmic ray albedo neutron decay source. For L>or = 1.7 additional trapped proton differential energy measurements should be made before the theory can be adequately tested. It appears that an additional loss mechanism such as pitch angle scattering may be required. Author (GRA)

N73-30827# Texas Univ., Austin. Applied Mechanics Research Lab.
A QUASIRELATIVISTIC THEORY OF TWO FINITE MASSES
James Earl Strub Aug. 1972 85 p refs

(Contract N00014-67-A-0126-0007)
(AD-763431; AMRL-1047) Avail: NTIS CSCL 03/3

Presented here in Euclidean space and Newtonian time is a quasirelativistic theory of two-body motion in which both bodies have mass. The theory arises from superimposing directly onto Newton's Law of Gravitation the relativistic trait of interaction at finite speed, and from analyzing the acceleration of a body relative to an inertial frame of Mach rather than to coordinates centered in the opposite body. The principal non-Newtonian result is a secular increase of the semi-major axis. A result of considerably less magnitude is a forward rotation of the line of apsides. Quantitative effects of the theory are obtained by numerical integration of representative orbits of the solar system and of binary stars. Results are tabulated and compared with corresponding integrations of the Newtonian and, for the planets, Schwarzschildian equations. (Modified author abstract) GRA

N73-30828# Raytheon Co., Wayland, Mass.
ERROR PROPAGATION INTO ORBITAL POSITION Final Technical Report, Mar. - Dec. 1972
Clifford W. Greve Jan. 1973 47 p refs
(Contract DAAK02-72-C-0468)
(AD-763288; FTR-3467; ETL-CR-72-13) Avail: NTIS CSCL 22/3

The main portion of the report deals with theoretical analysis of error propagation into orbital positions with emphasis placed on explaining some of the observed phenomena pertaining to orbital data, especially when used in conjunction with non-orbital data. The appendix deals with the writing of a computer program which would perform a least-squares adjustment of combined orbital and non-orbital data, with observations being limited to ranges between stations. A non-rigorous capability of using direction cosine data was also included in this program for added versatility. This program is operational on the UNIVAC 1108 computer at the National Bureau of Standards.
Author (GRA)

N73-30765* Arizona Univ., Tucson.
MAP OF THE GALACTIC NUCLEUS AT 10 MICRONS
G. H. Rieke and F. J. Low *In its* Commun. of the Lunar and Planetary Lab., Vol. 9, Pt. 3 1972 p 181-183 refs (For availability see N73-30761 21-29)
(LPL-Commun-169) CSCL 03B

N73-30767* Arizona Univ., Tucson.
SULFURIC ACID IN THE VENUS CLOUDS
Godfrey T. Sill *In its* Commun. of the Lunar and Planetary Lab., Vol. 9, Pt. 3 1972 p 191-198 refs (For availability see N73-30761 21-29)
(LPL-Commun-171) CSCL 03B

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also; 28 Propulsion Systems; and 32 Structural Mechanics.

N73-30829* Fairchild Hiller Corp., Germantown, Md.
THERMAL CONTROL SYSTEM FOR A SPACECRAFT MODULAR HOUSING Patent
Robert J. Eby and Edward I. Powers, inventors (to NASA) Issued 31 Jul. 1973 7 p Filed 17 Apr. 1972 Supersedes N72-25871 (10 - 16, p 2216) Sponsored by NASA
(NASA-Case-GSC-11018-1; US-Patent-3,749,156; US-Patent-Appl-SN-244523; US-Patent-Class-165-32; US-Patent-Class-165-96; US-Patent-Class-165-105; US-Patent-Class-244-1SS; US-Patent-Class-165-47) Avail: US Patent Office CSCL 20M

The development of a thermal control system for a spacecraft module is discussed. The wall structures are composed of superinsulation in some cases and of thermally conductive material in other cases. Heat pipes are installed to provide a path of heat transfer from the interior of the module to space. The design of the system makes it possible to maintain a relatively uniform temperature throughout the module with side variations of the amount of heat dissapated by the components within the module. Official Gazette of the U.S. Patent Office

N73-30830*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PRESSURE SIGNATURES FOR A .00053 SCALE MODEL OF THE SATURN 5-APOLLO LAUNCH VEHICLE WITH SIMULATED EXHAUST PLUMES
Raymond M. Hicks and Joel P. Mendoza Jul. 1973 31 p refs
(NASA-TM-X-62129) Avail: NTIS HC $3.75 CSCL 22B

Wind tunnel pressure signatures are presented for 10 Mach numbers over a range from 3.01 to 7.29 for a .00053-scale model of the Saturn 5 Apollo launch vehicle complete with escape tower and solid body simulated exhaust plumes for each Mach number. The effect of simulated plume length on the wind tunnel pressure signature was investigated at Mach 4.01. An analysis of the error incurred by extrapolating pressure signatures having strong shock waves by weak shock procedures is presented. Author

N73-30831*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EFFECTS OF ASCENT TRAJECTORY MODE AND TANK DISPOSAL METHOD ON SHUTTLE PAYLOAD ACCOMMODATION
James C. Blair, William W. Heuser, and Jerome R. Redus 10 Aug. 1973 44 p refs
(NASA-TM-X-64773) Avail: NTIS HC $4.25 CSCL 22B

The effects of external tank disposal by retrorocket versus passive tank drop, and targeting the main engine burn for high apogee versus the baseline parking orbit ascent method on shuttle payload accommodation capability were investigated. Missions launched from Eastern Test Range were investigated over a range of orbit altitudes to determine tank disposal requirements including footprint dispersions and alternate impact locations, performance, and orbital maneuvering system requirements. Passive tank drop also proved to be advantageous from a payload accommodation standpoint. Direct insertion was shown to be a means of accommodating long payloads at higher altitudes than permitted by the baseline ascent method. Author

N73-30832*# Martin Marietta Corp., Baltimore, Md.
VARIABLE RATIO MIXED-MODE BILATERAL MASTER-SLAVE CONTROL SYSTEM FOR SHUTTLE REMOTE MANIPULATOR SYSTEM Patent Application
Shepard B. Brodie, Carl R. Flatau, and Fredrick J. Greeb, inventors (to NASA) Filed 20 Aug. 1973 24 p
(Contract NAS9-11932)
(NASA-Case-MSC-14245-1; US-Patent-Appl-SN-389916) Avail: NTIS HC $3.25 CSCL 22B

A variable ratio, mixed-mode, bilateral master-slave control system for the space shuttle remote manipulator system is described. The construction of the device and the method of operation are explained. Applications for other than the space shuttle mission are suggested. NASA

N73-30833*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE DELTA LAUNCH VEHICLE MODEL 2914 SERIES
Charles R. Gunn Sep. 1973 36 p Submitted for publication
(NASA-TM-X-70455; X-470-73-262) Avail: NTIS HC $4.00 CSCL 22B

The newest Delta launch vehicle configuration, Model 2914 is described for potential users together with recent flight results. A functional description of the vehicle, its performance, flight profile, flight environment, injection accuracy, spacecraft integration requirements, user organizational interfaces, launch operations, costs and reimbursable users payment plan are provided. The versatile, relatively low cost Delta has a flight demonstrated reliability record of 92 percent that has been established in 96 launches over twelve years while concurrently undergoing ten major upratings to keep pace with the ever increasing performance and reliability requirements of its users. At least 40 more launches are scheduled over the next three years from the Eastern and Western Test Ranges. Author

N73-30834*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NASA COMPENDIUM OF SATELLITE COMMUNICATIONS PROGRAMS
Jun. 1973 482 p refs Prepared in cooperation with Computer Sciences Corp.
(Contract NAS5-21522)
(NASA-TM-X-70435; X-751-73-178) Avail: NTIS HC $26.25 CSCL 22A

A comprehensive review is presented of worldwide communication programs that range in time from the inception of satellite communications to August 1971. The programs included are: Echo, Courier, West Ford, Telstar, Relay, Syncom, Lincoln experimental satellites, Intelsat, Tacsat, Skynet, Nato system, and Telesat. T.M.R.

N73-30835*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
INTEGRATED DIGITAL FLIGHT CONTROL SYSTEM FOR THE SPACE SHUTTLE ORBITER
Jul. 1973 346 p refs Revised
(Contract NAS9-11764; DSR Proj. 55-47300)
(NASA-CR-134001; E-2736-Rev-1) Avail: NTIS HC $19.50 CSCL 22B

The objectives of the integrated digital flight control system (DFCS) is to provide rotational and translational control of the space shuttle orbiter in all phases of flight: from launch ascent through orbit to entry and touchdown, and during powered horizontal flights. The program provides a versatile control system structure while maintaining uniform communications with other programs, sensors, and control effectors by using an executive routine/functional subroutine format. The program reads all external variables at a single point, copies them into its dedicated storage, and then calls the required subroutines in the proper sequence. As a result, the flight control program is largely independent of other programs in the computer complex and is equally insensitive to characteristics of the processor configuration. The integrated structure is described of the control system and the DFCS executive routine which embodies that structure. The input and output, including jet selection are included. Specific estimation and control algorithm are shown for the various mission phases: cruise (including horizontal powered flight), entry, on-orbit, and boost. Attitude maneuver routines that interface with the DFCS are included. Author

N73-30836*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
VIKING ORBITER 1975 ARTICULATION CONTROL SUBSYSTEM DESIGN ANALYSIS
H. H. Horiuchi and L. J. Vallas 15 Jul. 1973 83 p
(Contract NAS7-100)
(NASA-CR-135649; JPL-TM-33-599) Avail: NTIS HC $6.25 CSCL 22B

The articulation control subsystem, developed for the Viking Orbiter 1975 spacecraft, is a digital, multiplexed, closed-loop servo system used to control the pointing and positioning of the science scan platform and the high-gain communication antenna, and to position the solar-energy controller louver blades for the thermal control of the propellant tanks. The development, design, and anlaysis of the subsystem is preliminary. The subsystem consists of a block-redundant control electronics multiplexed among eight control actuators. Each electronics block is capable of operating either individually or simultaneously with the second block. This provides the subsystem the capability of simultaneous two-actuator control or a single actuator control with the second block in a stand-by redundant mode. The result of the preliminary design and analysis indicates that the subsystem will perform satisfactorily in the Viking Orbiter 1975 mission. Some of the parameter values used, particularly those in the subsystem dynamics and the error estimates, are preliminary and the results will be updated as more accurate parameter values become available. Author

N73-30837*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.
ANALYSIS AND SIMULATION OF THE MARINER MARS 1971 SCAN PLATFORM: SPACECRAFT DYNAMIC INTERACTION
L. Schumacher 15 Aug. 1973 62 p refs
(Contract NAS7-100)
(NASA-CR-133793; JPL-TM-33-624) Avail: NTIS HC $5.25 CSCL 22B

The equations of motion are developed which describe the dynamic interaction between the spacecraft bus and the movable appendages about a single axis. The effect is evaluated of the dynamic interaction on the attitude control subsystem with computer simulations, and design recommendations to reduce the impact of this interaction on future attitude control subsystems are presented. Author

N73-30838*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SLOSH TESTING OF A SPHERICAL MERCURY PROPELLANT TANK WITH POSITIVE-EXPULSION DIAPHRAGM
R. G. Ross, Jr. and J. R. Womack 15 Jul. 1973 45 p refs
(Contract NAS7-100)
(NASA-CR-133790; JPL-TM-33-632) Avail: NTIS HC $4.25 CSCL 22C

A preliminary investigation was conducted to evaluate the lateral slosh characteristics of a 23-cm diameter mercury propellant tank with a positive-expulsion diaphragm and 17.5% ullage. Data are presented for tank sinusoidal acceleration levels between 0.05 and 0.5 g at frequencies ranging from 5 to 50 Hz. Results indicate that slosh characteristics are highly nonlinear at acceleration levels approaching those in flight, and depend heavily on the shape and stiffness of the diaphragm. Nyquist plots of driving force over acceleration are shown to be a useful tool for determining natural frequency, damping, and modal mass characteristics. A computerized nonlinear least squares method for extracting the modal parameters from the Nyquist plots is described and results of applying the method are presented. Author

N73-30839*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SUBOPTIMAL STOCHASTIC CONTROLLER FOR AN n-BODY SPACECRAFT
V. Larson 15 Aug. 1973 35 p refs
(Contract NAS7-100)
(NASA-CR-133788; JPL-TM-33-640) Avail: NTIS HC $3.75 CSCL 22B

The problem is studied of determining a stochastic optimal controller for an n-body spacecraft. The approach used in obtaining the stochastic controller involves the application, interpretation, and combination of advanced dynamical principles and the theoretical aspects of modern control theory. The stochastic controller obtained for a complicated model of a spacecraft uses sensor angular measurements associated with the base body to obtain smoothed estimates of the entire state vector, can be easily implemented, and enables system performance to be significantly improved. Author

N73-30840*# McDonnell Aircraft Co., St. Louis, Mo.
A STUDY OF THE ROLE OF PYROTECHNIC SYSTEMS ON THE SPACE SHUTTLE PROGRAM
E. R. Lake, S. J. Thompson, and V. W. Drexelius Washington NASA Sep. 1973 97 p refs
(Contract NAS1-10892)
(NASA-CR-2292) Avail: NTIS HC $3.75 CSCL 22B

Pyrotechnic systems, high burn rate propellant and explosive-actuated mechanisms, have been used extensively in aerospace vehicles to perform a variety of work functions, including crew escape, staging, deployment and destruction. Pyrotechnic system principles are described in this report along with their applications on typical military fighter aircraft, Mercury, Gemini, Apollo, and a representative unmanned spacecraft. To consider the possible pyrotechnic applications on the space shuttle the mechanical functions on a large commercial aircraft, similar in scale to the shuttle orbiter, were reviewed. Many potential applications exist for pyrotechnic system on the space shuttle, both in conventional short-duration functions and in longer duration and/or repetitive type gas generators. Author

N73-30841*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

POSTFLIGHT SIMULATION OF PARACHUTE DEPLOYMENT DYNAMICS OF VIKING QUALIFICATION FLIGHT TESTS
Charles H. Whitlock, Lamont R. Poole, and Theodore A. Talay Washington Sep. 1973 38 p refs
(NASA-TN-D-7415; L-9145) Avail: NTIS HC $3.00 CSCL 22B

Simulation calculations of the Viking qualification flight tests are conducted by use of analytical models of the parachute deployment dynamics process. Results from the study indicate that good simulations of event times and trajectory are obtained. If the full-scale parachute drag coefficient is used, a good simulation of first opening load is obtained and the overall nature of the load history is calculated. For longitudinal motions, the two-degree-of-freedom models give good agreement with a six-degree-of-freedom model. It is believed that the analytical models used are tools which will aid in the analysis of future flight systems. Author

N73-30842*# Boeing Co., Huntsville, Ala. Launch Systems Branch.
STATISTICAL DETERMINATION OF SPACE SHUTTLE COMPONENT DYNAMIC MAGNIFICATION FACTORS
F. Lehner 31 May 1973 81 p refs
(Contract NAS8-28650)
(NASA-CR-124337; D5-17250) Avail: NTIS HC $6.25 CSCL 22B

A method is presented of obtaining vibration design loads for components and brackets. Dynamic Magnification Factors from applicable Saturn/Apollo qualification, reliability, and vibroacoustic tests have been statistically formulated into design nomographs. These design nomographs have been developed for different component and bracket types, mounted on backup structure or rigidly mounted and excited by sinusoidal or random inputs. Typical nomographs are shown. Author

N73-30843*# GCA Corp., Bedford, Mass. Technology Div.
DEFINITION RESEARCH STUDY Final Report
F. F. Marmo and J. Pressman Apr. 1973 82 p refs
(Contract NASw-2395)
(NASA-CR-133836; GCA-TR-73-4-N) Avail: NTIS HC $6.25 CSCL 22B

Data were complied on the physical behavior and characteristics of plasma gas and/or dust in the context of how they relate to the self-contamination of manned orbiting vehicles. A definition is given of a systematic experimental program designed to yield the required empirical data on the plasma, neutral gas, and/or the particulate matter surrounding the orbiting vehicles associated with shuttle missions. Theoretical analyses were completed on the behavior of materials to be released from the orbiting or subsatellite shuttle vehicles. The results were used to define some general experimental design recommendations directly applicable to the space shuttle program requirement. An on-board laser probe technique is suggested for measuring the dynamic behavior, inventory, and physical characteristics of particulates in the vicinity of an orbiting spacecraft. Laser probing of cometary photodissociation is also assessed. Author

N73-30844*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
ALTERNATE CONCEPTS STUDY EXTENSION. VOLUME 1: EXECUTIVE SUMMARY Final Report
15 Nov. 1971 37 p
(Contract NAS8-26362)
(NASA-CR-124345; ACS-201; LMSC-A995931-Vol-1) Avail: NTIS HC $4.00 CSCL 22B

An analysis of alternate space shuttle concepts is presented. The two main program alternatives are: (1) phased booster development with an interim solid rocket engine cluster preceding the reusable booster and (2) phased orbiter development with modified avionics, vehicle subsystems, thermal protection system, and redesigned rocket engines. Diagrams of the various concepts are provided. The predicted spacecraft performance capabilities are reported. Project management proposals are submitted. Author

N73-30845*# Applied Dynamics Research Corp., Huntsville, Ala.
SPACE SHUTTLE DAMPER SYSTEM FOR GROUND WIND LOAD TESTS Final Report, 17 Apr. 1972 - 16 Apr. 1973
G. D. Robinson, J. R. Holt, and C. S. Chang 16 Apr. 1973 68 p refs
(Contract NAS8-28613)
(NASA-CR-124367; T1045F) Avail: NTIS HC $5.50 CSCL 22B

An active damper system which was originally developed for a 5.5% Saturn IB/Skylab Ground Winds Model was modified and used for similar purposes in a Space Shuttle model. A second damper system which was originally used in a 3% Saturn V/Dry Workshop model was also modified and made compatible with the Space Shuttle model to serve as a back-up system. Included in this final report are descriptions of the modified damper systems and the associated control and instrumentation. Author

N73-30846*# Fairchild Industries, Inc., Germantown, Md.
STANDARDIZATION AND ECONOMICS OF NUCLEAR SPACECRAFT: EXECUTIVE SUMMARY Final Report on Phase 1, SENSE Study
5 Jan. 1973 61 p Sponsored in part by NASA
(Contract AT(49-15)-3063)
(NASA-CR-133743; SNSO-3063-1) Avail: NTIS HC $5.25 CSCL 22B

Feasibility and cost benefits of nuclear-powered standardized spacecraft were investigated. The study indicates that two shuttle-launched nuclear-powered spacecraft should be able to serve the majority of unmanned NASA missions anticipated for the 1980's. The standard spacecraft include structure, thermal control, power, attitude control, some propulsion capability and tracking, telemetry, and command subsystems. One spacecraft design, powered by the radioisotope thermoelectric generator, can serve missions requiring up to 450 watts. The other spacecraft design, powered by similar nuclear heat sources in a Brayton-cycle generator, can serve missions requiring up to 2200 watts. Design concepts and trade-offs are discussed. The conceptual designs selected are presented and successfully tested against a variety of missions. The thermal design is such that both spacecraft are capable of operating in any earth orbit and any orientation without modification. Author

N73-30847# European Space Research and Technology Center, Noordwijk (Netherlands).
SOME CONTAMINATION PROBLEMS IN THE ASTRONOMICAL SATELLITE TD-1A
J. Dauphin, G. Schamle, and A. Zwaal Paris ESRO Jan. 1973 18 p refs Presented at the Space Simulation conf., New York, 1-3 May 1972; sponsored by the Inst. of Environ. Sci., AIAA, AM. Soc. for Testing and Mater., and NASA
(ESRO-TN-86-ESTEC) Avail: NTIS HC $3.00

The astronomical satellite TD-1A carries two stellar UV telescopes, which are extremely sensitive to chemical contamintion of their optical surfaces. It was important for the success of the project that contamination be kept to a minimum both on the ground during integration and testing and in space during operation. In view of this, the materials to be used in the construction of the satellite were selected with the utmost care, use being made of the Micro-VCM technique. Some typical cases of materials evaluation are described. It was also necessary to monitor the cleanliness of the satellite constantly during integration and testing, particularly during the prolonged thermal vacuum tests. For this purpose, UV and IR spectroscopy techniques employing suitable sensors were used. Author (ESRO)

N73-30848# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Aeroelastik.
AN ANALYTICAL APPROACH TO THE SOLUTION OF NONLINEAR AEROELASTIC GALLOPING INSTABILITY
H. Foersching and V. Manea (Inst. de Mecan. Fluidelor si Constructii Aerospatiale, Bucharest) 1973 54 p refs In GERMAN; ENGLISH summary Sponsored in part by Alexander von Humboldt-Stift.
(DLR-FB-73-18; AVA-FB-7224) Avail: NTIS HC $4.75; DFVLR, Porz, West Ger. 12 DM

An approximative analytical procedure for the solution of a nonlinear aeroelastic galloping stability problem is presented. The nonlinear aerodynamic term in the stability equation is replaced

by a polygonal function, and the stability equation is then solved applying the phase-plane method. The details of the analytical procedure are described and further explained by means of a typical example, in which the galloping stability of a U beam is investigated. Reference is made to the ground wind response of space shuttle structures. Author (ESRO)

N73-30849# European Space Research and Technology Center, Noordwijk (Netherlands).
THE ORBITAL TEST SATELLITE FOR THE EUROPEAN COMMUNICATION SATELLITES PROGRAMME: PERFORMANCE AND GROWTH CAPABILITY
A. W. Preukschat 1973 36 p Presented at the DGLR Symp. on Nachrichten Satelliten, Stuttgart, 16-17 May 1973
(DGLR-Paper-73-044) Avail: NTIS HC $4.00

The background to the orbital test satellite (OTS) for the European Communication Satellite Program is discussed. The performance parameters of the OTS - launch configuration, spacecraft platform, communications payload, and integrated OTS are then described. The OTS growth capability is evaluated and adaptation of the OTS to possible television broadcast satellite (TVBS) missions is considered. ESRO

N73-30850# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
HEWITT CAMERA OBSERVATIONS MADE AT EARLYPOINT ON VARIOUS SATELLITES FROM 1 JANUARY 1973 TO 31 MAY 1973
K. S. Russell 1 Jun. 1973 46 p
(ROE-STS-153) Avail: NTIS HC $4.50

Satellite observations made with a Hewitt camera at Earlyburn Outstation are listed in launch and time order for each satellite for the period from 1 January 1973 to 31 May 1973. ESRO

N73-30851# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES MADE DURING THE MONTH OF MAY 1973
R. D. Eberst 11 Jun. 1973 19 p
(ROE-STS-154) Avail: NTIS HC $3.00

Stopwatch observations made at stations connected with the Section during May 1973 are listed in satellite launch and time order. Two hundred forty one fully reduced observations of 74 satellites are included. Author (ESRO)

N73-30852# European Space Research Organization, Paris (France). Technical and Industrial Policy Div.
EUROPEAN ACTIVITIES IN SPACE TECHNOLOGY, 1971 - 1972
Feb. 1973 182 p
(ESRO-SP-91) Avail: NTIS HC $11.25

An inventory of European activities in the field of space technology or, more precisely, satellite technology, is presented. The inventory lists information collected by ESRO by means of an inquiry conducted in mid-1972. The activities, classed according to their nature, include telecommunication and data processing techniques, attitude measurement and control, propulsion, power supply, onboard equipment, structures, materials, mechanisms, thermal control, materials for various applications, lubrication, bearings, electronic equipment, reliability, electromechanical and optical devices, etc. ESRO

N73-30853# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
RECEIVER (INFRARED SEEKERS) Final Report on Test Operation Procedure
5 Jun. 1973 55 p refs Supersedes AD-718677
(AD-763324; AD-718677; TOP-5-2-527) Avail: NTIS CSCL 16/4

The report describes a method for evaluation of heat seeking missiles and discusses preliminary activities, equipment, and facilities required. Provided are procedures for gyro spin-up time, gyro spin-up current, gyro spin-down time, maximum look angle, recovery time, maximum slew rate, gyro drift, signal-to-noise ratio, cool-down time, field-of-view, caging accuracy, static gain, spectral responsivity, intercept ability, gyro spin versus slew rate, maximum tracking versus gyro spin, maximum tracking rate versus target intensity, low temperature storage and operation, high temperature storage and operation, transportation vibration, handling shock, and boost shock. The report also discusses gyro spin-up time, maximum look angle, signal-to-noise ratio and low temperature storage and is limited to infrared seekers. (Modified author abstract) GRA

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N73-30854 Syracuse Univ., N.Y.
FATIGUE CRACK TIP DEFORMATION AND FATIGUE CRACK PROPAGATION Ph.D. Thesis
Tai Shan Kang 1972 121 p
Avail: Univ. Microfilms Order No. 73-7733

The effects of stress ratio, prestress cycling and plate thickness on the fatigue crack propagation rate are studied on 2024-T351 aluminum alloy. Fatigue crack propagation rate increases with the plate thickness and the stress ratio. Prestress cycling below the static yield strength has no noticeable effect on the fatigue crack propagation rate. However, prestress cycling above the static yield strength causes the material to strain harden and increases the fatigue crack propagation rate. Crack tip deformation is used to study the fatigue crack propagation. The crack tip strains and the crack opening displacements were measured from moire fringe patterns. The moire fringe patterns were obtained by a double exposure technique, using a very high density master grille (13,400 lines per inch). Dissert. Abstr.

N73-30855 Northwestern Univ., Evanston, Ill.
STRAIN-RATE SENSITIVITY AND YIELD STRESS OF Fe-Mo, Fe-Ti AND Fe-Re SOLID SOLUTIONS Ph.D. Thesis
Dirk Leemans 1972 101 p
Avail: Univ. Microfilms Order No. 73-10252

The effect of alloying on the plastic deformation of polycrystalline iron was investigated in the temperature range from 77 K to 296 K for three alloy systems. Fe-Mo, Fe-Ti and Fe-Re solid solutions were tested in tension and yield stress and strain rate sensitivity were measured. Fe-Mo and Fe-Re alloys were annealed in wet H2 and have a lower impurity concentration than the vacuum annealed Fe-Ti alloys. The data at room temperature indicate that impurities play an important role at this temperature and the softening can be explained adequately by a scavenging theory, i.e., the titanium solute atoms remove mobile impurity atoms from solution. Dissert. Abstr.

N73-30856 National Lending Library for Science and Technology, Boston Spa (England).
RESEARCH INTO THE STRESSED AND STRAINED STATE DURING THE PLASTIC DEFORMATION OF MECHANICALLY HETEROGENEOUS MEDIA (CLAD METALS) USING THE OPTICALLY SENSITIVE COATINGS METHOD
Yu. M. Matveev, L. I. Zaionchik, L. L. Sitnikov, and V. Y. Ostryakov [1973] 2 p Transl into ENGLISH from Stal. (Moscow), no. 12, 1972 p 1128
(NLL-M-21653-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The analysis of the state of a mechanically heterogeneous material during deformation by using optically sensitive coatings is discussed. The application of the coatings to the specimens and the method for conducting the test are described. Equations have been obtained for the coefficient of rigidity which represents the conditions under which the core of a tube blank breaks down with different systems of homogeneity. Author

N73-30857 National Lending Library for Science and Technology, Boston Spa (England).
THE WIND LOAD ON STRUCTURES
G. A. Savitskii 5 Jun. 1973 86 p refs Transl. into ENGLISH of the publ. "Vetrovaya Nagruzka na Sooruzheniya" Moscow, Izd-vo Lit. po Stroit., 1972
(NLL-Lib-Trans-1705-(5205.9)) Avail: Natl. Lending Library,

Boston Spa, Engl.: 9 NLL photocopy coupons

The regional wind load intensity map was formulated on the basis of flat regions. Local relief peculiarities at a given geographic point are not indicated in the map because of numerical deficiencies in the disposition of the meteorological stations and the small scale of the map. Thus major significance attaches to general data concerning the effect of valleys, hills, mountain systems, large water surfaces, urban development with tall buildings, large wooded areas, etc. In view of the random nature of the phenomenon, an estimate of the calculated wind speed and an analysis of the effects of its gustiness can only be made on the basis of mathematical statistics. The wind load on structures depends not only on the dimensions of the structure and the wind speed, but also on their structural shape, characterised by aerodynamic coefficients. The only guarantee for correct design of structures is a clear-cut physical representation of the effect of wind on the structures, based among other things on adjacent scientific disciplines, in particular applied climatology, aerodynamics, mathematical statistics, and oscillation theory. Author

N73-30858 National Lending Library for Science and Technology, Boston Spa (England).

STUDIES ON THE COMPRESSION OF POWDER-LIKE MATERIALS. 9: SOME THEORETICAL CONSIDERATIONS OF COMPRESSION-STATE EQUATIONS OF POWDER-LIKE MATERIALS

Sadao Bessho, Suichi Tomioka, and Shiro Ito 5 Jun. 1973 10 p refs Transl. into ENGLISH from Yakugaku Zasshi (Japan), v. 92 no. 6, 1972 p 686-693

(NLL-NEL-RR-2474-(6075.461)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The properties of powder materials when subjected to compression forces are discussed. The basic theory of compressed state equations and mathematical models for powder materials are presented. The energy equation is obtained by applying powder mechanics techniques in which the powder material is considered as a macroscopic continuum and relating this to the principles of the energy conservation law. Author

N73-30859 Stanford Univ., Calif.

STRESS CORROSION CRACKING Ph.D. Thesis

Robert John Asaro 1972 245 p

Avail: Univ. Microfilms Order No. 73-6471

An approach to the problem of stress corrosion cracking in metal alloys is presented. The problem of the mechanical stability of thin passive films is examined. It is found that stress concentrations developed in thin films are typically an order of magnitude greater than those within the bulk of grains. The problem of stress corrosion cracking in homogeneous metal alloys containing noble constituents is discussed. Certain aspects of the thermodynamic theory of stressed solids are discussed. The problem of concentration polarizations within cracks is cast into the form of boundary value problems for mass transport. The experimental work on alpha brass in complexing environments and austenitic stainless steels in chloride and caustic environments is presented. Dissert. Abstr.

N73-30860# National Research Council of Canada, Ottawa (Ontario).

ON THE CONVERGENCE OF THE GALERKIN METHOD IN NON-CONSERVATIVE STABILITY PROBLEMS CONCERNING THIN ELASTIC PLATES AND SLENDER ELASTIC RODS

H. Leipholz 1973 27 p refs Transl. into ENGLISH from Ingenieur-Archiev (West Ger.), v. 34, no. 5, 1965 p 290-303 (NRC-TT-1673) Avail: NTIS HC $3.50

The convergence of the Galerkin method for nonconservative stability problems is discussed. The convergence of the method for plate and rod problems using conventional assumptions is proven. Problems of this type are important in the field of aeroelasticity because of the occurrence of tangential non-directional forces. Author

N73-30861*# Bell Aerospace Co., Buffalo, N.Y.

IMPROVEMENTS TO NASTRAN

May 1973 29 p refs

(Contract NAS1-10917)

(NASA-CR-132283; Rept-8667-950001) Avail: NTIS HC $3.50 CSCL 20K

Improvements to the operational capabilities of NASTRAN are reported. The improvements include the development and implementation of a number of new finite elements into the existing NASTRAN element library and also the development of a finite element heat transfer analysis capability. Author

N73-30862*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

MATRIX PERTURBATION TECHNIQUES IN STRUCTURAL DYNAMICS

T. K. Caughey 1 Sep. 1973 47 p refs

(Contract NAS7-100)

(NASA-CR-133795; JPL-TM-33-652) Avail: NTIS HC $4.50 CSCL 13B

Matrix perturbation are developed techniques which can be used in the dynamical analysis of structures where the range of numerical values in the matrices extreme or where the nature of the damping matrix requires that complex valued eigenvalues and eigenvectors be used. The techniques can be advantageously used in a variety of fields such as earthquake engineering, ocean engineering, aerospace engineering and other fields concerned with the dynamical analysis of large complex structures or systems of second order differential equations. A number of simple examples are included to illustrate the techniques. Author

N73-30863*# Boeing Commercial Airplane Co., Seattle, Wash.

ELASTIC BUCKLING ANALYSIS FOR COMPOSITE STIFFENED PANELS AND OTHER STRUCTURES SUBJECTED TO BIAXIAL INPLANE LOADS

A. V. Viswanathan and M. Tamekuni Washington NASA Sep. 1973 88 p refs

(Contract NAS1-8858)

(NASA-CR-2216) Avail: NTIS HC $3.75 CSCL 20K

An exact linear analysis method is presented for predicting buckling of structures with arbitrary uniform cross section. The structure is idealized as an assemblage of laminated plate-strip elements, curved and planar, and beam elements. Element edges normal to the longitudinal axes are assumed to be simply supported. Arbitrary boundary conditions may be specified on any external longitudinal edge of plate-strip elements. The structure or selected elements may be loaded in any desired combination of inplane transverse compression or tension side load and axial compression load. The analysis simultaneously considers all possible modes of instability and is applicable for the buckling of laminated composite structures. Numerical results correlate well with the results of previous analysis methods. Author

N73-30864*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

STATUS OF TWO STUDIES ON ACTIVE CONTROL OF AEROELASTIC RESPONSE

Irving Abel and Matnard C. Sandford Washington Sep. 1973 29 p refs

(NASA-TM-X-2909; L-9251) Avail: NTIS HC $3.00 CSCL 20K

The application of active control technology to the suppression of flutter has been successfully demonstrated during two recent studies in the Langley transonic dynamics tunnel. The first study involved the implementation of an aerodynamic-energy criterion, using both leading- and trailing-edge controls, to suppress flutter of a simplified delta-wing model. Use of this technique has resulted in an increase in the flutter dynamic pressure of approximately 12 percent for this model at a Mach number of 0.9 Analytical methods used to predict the open- and closed-loop behavior of the model are also discussed. The second study, was conducted to establish the effect of active flutter suppression on a model of the Boeing B-52 Control Configured Vehicle (CCV). Some preliminary results of this study indicate significant improvements in the damping associated with the critical flutter mode. Author

N73-30865*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

CORRELATION OF NEW HYPERVELOCITY IMPACT DATA BY THRESHOLD PENETRATION RELATIONS

Robert J. Hayduk, Paul S. Gough (Space Res. Corp., North Troy, Vt.), and Emilio Alfaro-Bou Washington Sep. 1973 29 p

refs
(NASA-TN-D-7308; L-8911) Avail: NTIS HC $3.00 CSCL 20K

Threshold penetration data are established by impacting spherical projectiles onto 2024 aluminum single-wall targets. Nylon and cadmium projectiles were used at impacting velocities from 3.0 to 6.8 km/s and 7.9 to 8.5 km/s respectively. These data are combined with existing data and compared with three threshold relations to assess their respective validities over a wide range of projectile densities. Two of these relations were validated over the extended range of projectile densities. Author

N73-30866*# Technology, Inc., Dayton, Ohio. Instruments and Control Div.
METHODOLOGY FOR A DECISION OF THE STATIC TEST OF LARGE VEHICLES
Gary L. Martin and Innes Bouton Feb. 1973 66 p refs
(Contract NAS8-26918)
(NASA-CR-124366; TI-42520-73-20) Avail: NTIS CSCL 20K

Considerations are reported of factors and objectives of the design procedures for static tests as part of the structural verification. Data is presented which supports the effectiveness of the test in the function of error-disclosure. Also, data passing the static test. The costs and risks associated with both test alternatives are discussed and combined with respect to the possible outcomes of the decision. A decision model, based on cost-effectiveness, is then derived and several design procedures are reviewed in the light of the model to demonstrate the utility of the model. Author

N73-30867# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science and Engineering.
ENVIRONMENT AND FRACTURE Progress Report
H. H. Johnson 7 Mar. 1973 11 p ref
(Contract AT(11-1)-3166)
(COO-3166-5) Avail: NTIS HC $3.00

Research progress on phenomenology of hydrogen-induced cracking of structural materials and on parameters associated with cracking mechanisms in materials is summarized. Progress is reported on fatigue crack growth in steel, H diffusion in Fe near 300 K, and H diffusion in materials near cracks. NSA

N73-30868# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugzeugbau.
BUCKLING LOADS OF SHEET METAL SILOES WITH OVERLAPPING CIRCUMFERENTIAL SEAMS [BEULLASTEN VON STAHLSILOS MIT UEBERLAPPTEN RUNDNAEHTEN]
Maria Esslinger 22 Jan. 1973 28 p refs In GERMAN; ENGLISH summary
(DLR-FB-73-36) Avail: NTIS HC $3.50; DFVLR, Porz, West Ger. 9 DM

A numerical method which may be used to calculate the buckling loads of cylindrical siloes built up of overlapping ring segments is presented. The application of the method is demonstrated with an example. The Numerical results are discussed. Author (ESRO)

N73-30869# Royal Aircraft Establishment, Farnborough (England). Structures Dept.
OPTIMUM REINFORCEMENT AROUND A CIRCULAR HOLE IN A FLAT SHEET UNDER UNIAXIAL TENSION
E. H. Mansfield and Carol J. Hanson London Aeron. Res. Council 1973 13 p refs Supersedes RAE-TR-72013; ARC-33736
(ARC-R/M-3723; RAE-TR-72013; ARC-33736) Avail: NTIS HC $3.00; HMSO 55p; PHI $2.35

The optimum distributions of compact edge reinforcement around a circular hole in a flat elastic sheet subjected to uniaxial tension were determined. The optimization is effected by minimizing the stress concentration factor for given total weights of reinforcement. ESRO

N73-30870# Waterloo Univ. (Ontario). Dept. of Civil Engineering.
AN APPROACH TO THE ANALYSIS OF THE NONLINEAR DEFORMATION AND FATIGUE RESPONSE OF COMPONENTS SUBJECTED TO COMPLEX SERVICE LOAD HISTORIES
T. H. Topper and A. Conle Mar. 1973 29 p refs
(Grant AF-AFOSR-2120-71)
(AD-763780; AFOSR-73-1146TR) Avail: NTIS CSCL 11/6

The report describes recent progress in developing a fatigue analysis procedure suitable for complex load histories. A plastic notch deformation analysis is coupled with a model of inelastic material deformation response to determine the stress-strain history at the crack initiation location. Damage is computed by a technique which assesses events in this stress-strain history in terms of the fully reversed cycles encountered in the strain controlled tests used to determine (material fatigue properties). The material fatigue properties as they are employed in assessing fatigue resistance are represented in a parametric form which accounts for the influence of mean stress and straining sequence on fatigue life. Emphasis is placed on the integration of research in the various areas of fatigue into a comprehensive fatigue analysis procedure. A computer program for the fatigue analysis of notched parts subjected to complex load histories is used to illustrate one such procedure. Author (GRA)

N73-30871# Catholic Univ. of America, Washington, D.C. Stress Analysis Lab.
HELICES UNDER LOAD
A. J. Durelli, V. J. Parks, and H. M. Hasseem Jul. 1973 34 p refs
(Contract N00014-67-A-0377-001)
(AD-762776; Rept-31) Avail: NTIS CSCL 13/9

Previous solutions for the case of close coiled helical springs and for helices made of thin bars are extended to cover all the range of geometric parameters. The complete solution is presented in simple graphs, convenient for the use by designers. The theoretical development is correlated with new experiments. Author (GRA)

N73-30872# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Aerospace Engineering and Applied Mechanics.
BUCKLING ANALYSIS OF RING-STIFFENED OVAL ORTHOTROPIC CYLINDRICAL SHELLS
William L. Brodsky and William P. Vafakos Jun. 1973 89 p refs
(Contract N00014-67-A-0438-0006; NR Proj. 064-427)
(AD-763369; PIBAL-73-11) Avail: NTIS CSCL 20/11

An energy principle is employed to derive the equations governing the stability of a simply-supported, eccentrically ring-stiffened, oval, orthotropic cylindrical shell. The kinematic equations are those of Love-type shell theory and the effect of the reinforcing rings is accounted for by a distributed stiffness approach. The cylinder is subjected to a combination of uniform lateral and axial pressures. It is determined that the domain of stability of a stiffened cylinder is bounded by two separate solutions denoted as long and short axial wavelength solutions, the extent of the short wavelength solution being dependent upon the degree of stiffening afforded by the rings. (Modified author abstract) GRA

N73-30873# Naval Ordnance Lab., White Oak, Md.
EXPERIMENT ON RELATIVISTIC RIGIDTY OF A ROTATING DISK Final Report
Thomas E. Phipps, Jr. 30 Apr. 1973 69 p refs
(AD-763330; NOLTR-73-9) Avail: NTIS CSCL 20/11

Several theories have suggested the possibility that the space-time metric of a rotating disk could be nonstatic as well as non-Euclidean. These, and also a theory of optical aberration based on the Thomas precession of vectors, predict a (real or apparent) decrease in angular velocity with radius, even in an ideally rigid disk, with a rim lag time period of alpha v sq/c where v is rim speed, c is light speed, and alpha is a constant between 1 and 1/6, depending on the theory. A spinning-disk experiment was done at the Naval Ordnance Laboratory (NOL) over a four-month period of continuous rotation to look for such effects. (Modified author abstract) GRA

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N73-30874 National Lending Library for Science and Technology, Boston Spa (England).

FLOW, STABILITY AND MIXING IN COMBUSTION

W. H. Fritsch 4 Mar. 1973 17 p refs Transl. into ENGLISH from Tech. Mitt. PTT (Bern), v. 65, no. 3, Mar. 1982 p 101-109

(NLL-T1873/BGC/73-(9022.305)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The parameters involved in controlling the flow of combustion in order to maintain steady conditions and efficient combustion are analyzed. The restraint conditions which dictate initial combustor design are explained. Various methods of producing recirculation of combustible products are illustrated. Displacement of the flame front by changes in the combustion chamber pressure are discussed. The mixing processes required for efficient combustion are reported. P.N.F.

N73-30875 National Lending Library for Science and Technology, Boston Spa (England).

HEAT AND MASS TRANSFER OF A BOILING LIQUID WITH BUBBLES

V. I. Bronshtein and T. L. Perelman 4 May 1973 8 p refs Transl. into ENGLISH from Inzh.-Fiz. Zh. (BSSR), v. 23, no. 5, Nov. 1972 p 859-867

(NLL-WH-335-(9091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

A method is proposed for calculating bubble conditions in the flow of boiling liquid in vertical tubes. The determination of local characteristics of bubble conditions using the integral characteristics of bubble conditions and the dynamics of growth of separate bubbles is described. The equations of motion for bubble flow under various conditions are developed. Author

N73-30876# Aeronautical Research Labs., Melbourne (Australia).

TWO PHASE EVAPORATIVE COOLING OF AN AEROFOIL

B. Parmington Oct. 1972 28 p refs

(ARL/ME-338) Avail: NTIS HC $3.50

Preliminary experiments on two phase cooling of an airfoil immersed in a stream of combustion gas at temperatures of 800, 900, 1000, 1100, and 1200 C were conducted. Over the stated temperature range, the airfoil metal temperature varied from 170 C to 230 C giving a gas to metal temperature difference of 607 C to 982 C respectively. The application of the two phase cooling system to gas turbine blade cooling is proposed. Author

N73-30877# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.

A FINE SPECTRAL RESOLUTION (FSR) PROGRAM FOR THE CALCULATION OF INFRARED RADIATION EMITTED BY EXHAUST PLUMES

R. A. Martinsen and E. Stokes Fishburne Jul. 1973 40 p refs

(RM-575) Avail: NTIS HC $4.00

A computer program for predicting the infrared radiant heat transfer from an exhaust plume is described. The spectral resolution of the fine spectral resolution program for various wavelengths is tabulated. Graphs are presented to show the comparison of spectral absorptance measurement with predictions using the finer spectral resolution process. The modified program was verified by performing calculations for each constituent separately. Idealized flow fields were created for this purpose and the parameters are tabulated. Author

N73-30878# Santa Clara Univ., Calif. Dept. of Mechanical Engineering.

TIME TEMPERATURE RELATIONSHIPS IN LOW-PRESSURE IGNITION OF HYPERGOLIC LIQUIDS

Michel A. Saad and Samuel R. Goldwasser 15 Mar. 1973 36 p refs Backup document for AIAA Synoptic, "Time-Temperature Simulation in Low-Pressure Ignition of Hypergolic Liquids", scheduled for publication in AIAA Journal, in Jan. 1974

(Grant AF-AFOSR-1478-68)

Avail: NTIS HC $4.00 CSCL 21B

The ignition behavior of hypergolic liquids at ambient pressures below one atmosphere is discussed. The temperature of a droplet of liquid propellant as a function of time was calculated using a set of equations relating temperature, time, thermodynamic properties, and kinetics data. The equations deal with the rate at which heat is generated as the liquid decomposes chemically, and the rate at which heat is absorbed as the liquid vaporizes. An effort was made to relate ignition behavior to particle size. When vaporization was treated as a second order rate process, small particles were found more ignitible at low pressures than large particles. Author

N73-30879*# Scripta Technica, Inc., Washington, D.C.

PROBLEMS OF HEAT TRANSFER IN SPACE

O. N. Favorskiy and Ya. S. Kadaner NASA Aug. 1973 303 p refs Transl. into ENGLISH from the book "Voprosy Teploobmena v Kosmose" Moscow, Vysshaya Shkola, 1972 280 p

(Contract NASw-2484)

(NASA-TT-F-783) Avail: NTIS HC $7.00 CSCL 20M

Questions of external heat transfer under space conditions are discussed. The characteristics of radiant heat transfer in complex structures with mutual irradiation of elements (cooler-radiators of all possible configurations) are given prime consideration. Also considered are the thermal operating modes of spacecraft, taking into account solar and planetary radiation, and special features in the selection of certain types of space power - and cooling - systems as determined by the loss of heat from the cycle by radiation. A number of radiator structures are described and the principal methods for computing the most important of them are given. Author

N73-30880*# Martin Marietta Corp., Denver, Colo.

ABLATIVE HEAT SHIELD DESIGN FOR SPACE SHUTTLE Final Report, May 1972 - Aug. 1973

R. W. Seiferth Aug. 1973 279 p refs

(Contract NAS1-11592)

(NASA-CR-132282; MCR-73-147) Avail: NTIS HC $16.00 CSCL 20M

Ablator heat shield configuration optimization studies were conducted for the orbiter. Ablator and reusable surface insulation (RSI) trajectories for design studies were shaped to take advantage of the low conductance of ceramic RSI and high temperature capability of ablators. Comparative weights were established for the RSI system and for direct bond and mechanically attached ablator systems. Ablator system costs were determined for fabrication, installation and refurbishment. Cost penalties were assigned for payload weight penalties, if any. The direct bond ablator is lowest in weight and cost. A mechanically attached ablator using a magnesium subpanel is highly competitive for both weight and cost. Author

N73-30881# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).

IGNITION OF GASEOUS HYDROCARBON FUELS IN HYPERSONIC RAMJETS

F. Suttrop 23 Jun. 1973 45 p refs Presented at 1st Intern. Symp. on Air Breathing Engines, Marseille, France, 19-23 Jun. 1972

Avail: NTIS HC $4.25

Experimental results concerning the ignition characteristics of high velocity hydrocarbon diffusion flames are presented. The investigations covered the fuels methane, propane, ethylene and acetylene. A comparison is made between the hydrocarbon data and ignition data of hydrogen. Some of the considered tests were aimed to improve the conditions for thermal self-ignition of hydrocarbon diffusion flames by the use of additions. Results indicate that NO2-admixtures enable certain ignition temperature reductions in the case of the unsaturated hydrocarbons. However, the achieved gain is small. More promising results were obtained in the case of the saturated hydrocarbons, especially methane,

where the inflammability can be improved substantially by adding small mass fractions of hydrogen to the main fuel flow. Author

N73-30882# Cranfield Inst. of Technology (England). School of Mechanical Engineering.
CURRENT PROBLEMS AND TRENDS IN GAS TURBINE COMBUSTION
Arthur H. Lefebvre 1972 38 p refs Presented at 1st Intern. Symp. on Air Breathing Engines, Marseille, France, 19-23 Jun. 1972
Avail: NTIS HC $4.00

The combustion performance requirements of gas turbine engines are discussed. The problems involved in gas turbine combustion are: (1) altitude relighting for aircraft engines, (2) combustion of fuels ranging from natural gas to residual oil, and (3) wide variations in compressor discharge pressure, temperature, and airflow. Various methods for improving gas turbine combustion and reducing the amounts of emissions in the exhaust gases are described. The influence of aerodynamic processes on the design of matching fuel injection systems is analyzed. Author

N73-30883*# Union Carbide Corp., Tonawanda, N.Y.
REUSEABLE LIGHTWEIGHT MODULAR MULTI-LAYER INSULATION FOR SPACE SHUTTLE Final Report
K. F. Burr Jul. 1973 152 p refs
(Contract NAS3-14366)
(NASA-CR-121166) Avail: NTIS HC $9.75 CSCL 22B

The adaptation of the Self Evacuating Multilayer Insulation System to the space shuttle orbiter liquid hydrogen tanks was investigated. Small scale material screening tests and subscale panel tests demonstrated the potential of the insulation to withstand the anticipated 100 flight cycles. The composition of the material and the process for producing the finished insulation are described. Results of the various tests to determine the durability of the material are presented. Author

N73-30884*# Washington Univ., Seattle. Dept. of Mechanical Engineering.
CONSTRUCTION AND TESTING OF A GAS-LOADED, PASSIVE-CONTROL, VARIABLE-CONDUCTANCE HEAT PIPE Final Report
Creighton A. Depew, William J. Sauerbrey (Boeing Co., Seattle), and Bernard A. Benson (Boeing Co., Seattle) Apr. 1973 49 p refs
(NASA Order A-52728-A)
(NASA-CR-114597; M-4-26-73) Avail: NTIS HC $4.50 CSCL 20M

A methanol heat pipe using nitrogen gas for temperature control has been constructed and tested. The system was run over a power ratio of 15 (2 to 30 watts) with the heat source near ambient temperature and with the heat sink at a nominal value of 32 F. Control was obtained with a metal bellows gas reservoir which was actuated by an internal liquid-filled bellows. The liquid bellows was pressurized by expanding liquid methanol which was contained in an auxiliary reservoir in the evaporator heater block. It was demonstrated that the temperature variation of the heat source was reduced from 36 F for the heat pipe with no control to 7 F with the actuated bellows control. Author

N73-30885# United Kingdom Atomic Energy Authority, Harwell (England).
THERMAL DIFFUSION MECHANISMS AND POSSIBLE MASS TRANSPORT PATHS IN CLOSED CARBIDE AND OXYCARBIDE SYSTEMS
M. G. Adamson Dec. 1972 18 p refs
(AERE-R-6897) Avail: AEC Depository Libraries HC $3.00 UK 50 p

Several possible mechanisms for thermal diffusion of carbon fuels of varying purity were identified as a result of thermodynamic analyses of the U-C, U-C-H, U-C-O and (U,Pu)-C-O systems. Predictions of the direction of carbon migration in an applied temperature gradient are made for the various solid state and gas phase mass transport paths and, wherever possible, these are compared with existing experimental data. After considering UC1 + or - x and UC2-y as hypothetical pure fuels, real carbide fuels containing significant levels of hydrogen and/or oxygen impurities are treated in terms of the appropriate multicomponent phase equilibria. Results of this experimental approach indicate that uranium and uranium-plutonium carbide fuels fabricated via carbothermic reduction of the oxide and, to a lesser extent, true monoxycarbide fuels will undergo simultaneous transport of carbon and oxygen down the temperature gradient when operated at high power ratings. Author (NSA)

N73-30886*# Naval Ordnance Lab., White Oak, Md. Explosion Dynamics Div.
HNS/TEFLON EXPLOSIVE CHARGES FOR THE APOLLO 17 SEISMIC EXPERIMENT, LSPE
E. Eugene Kilmer 10 May 1973 22 p refs Sponsored by NASA
(NASA-CR-133838; AD-763331; NOLTR-73-44) Avail: NTIS HC $3.25 CSCL 19/1

A new plastic bonded explosive composed of HNS and Teflon was used in seismic charges on the recent APOLLO 17 space mission. Eight of the explosive charges were transported to the lunar surface aboard the LM vehicle and were subsequently detonated from earth. This report is concerned with the physical and detonation properties of dry blended HNS/TEFLON explosive charges and how such charges responded to environmental conditioning. Thermal cracking of the charges occurred, but this cracking did not affect charge performance. Author (GRA)

N73-30887# Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.
THE MECHANISM OF SUPER-RATE BURNING OF CATALYZED DOUBLE BASE PROPELLANTS Scientific Interim Report
N. Kubota, T. J. Ohlemiller, L. H. Caveny, and M. Summerfield Mar. 1973 222 p refs
(Contract N00014-67-A-0151-0023)
(AD-763786; AMS-1087) Avail: NTIS CSCL 21/2

The study is directed at understanding how organic lead salts (at the 1% level) alter the burning mechanisms of double base propellants to produce large (up to 300%) burning rate increases (super-rate burning) and domains of reduced burning rate pressure and temperature sensitivity (plateau burning). Investigations were carried out with nitrocellulose and trimethylolethane trinitrate (TMETN) double base propellants with systematic variations in additives (including lead powder, lead oxide, lead salicylate, copper powder, copper salicylate, finely divided carbon, and oxamide), particle size, and degree of dispersion. Diagnostic experiments (from 0.1 to 100 atm) examined burning rate behavior, gas-phase structure, burning-surface structure, temperature profiles in the reaction zones, and global effects. The portion of decomposed organic molecules which appears at the surface in the form of carbon rather than readily oxidizable aldehydes reduce the effective fuel to oxidizer ratio (aldehyde to NO2). (Modified author abstract) GRA

N73-30888# Army Foreign Science and Technology Center, Charlottesville, Va.
HEAT TRANSFER THEORY IN A LAYER WITH REGULAR CHANGE OF LIQUID FLOW DIRECTION
Y. A. Sherman 13 Mar. 1973 11 p refs Transl. into ENGLISH from Inzh. Fiz. Zh., Akad. Nauk Belorussk. SSR (Minsk), no. 1, 1970 p 21-26
(AD-762794; FSTC-HT-23-1998-72) Avail: NTIS CSCL 20/13

The problem of heat transfer in a layer of disperse material with periodic change in the direction of motion of liquid permeating the bed is formulated, with reference to the thermal resistance of the materials of the layer particles and to the nongradient course of the process. GRA

N73-30889# Purdue Univ., Lafayette, Ind. Project SQUID Headquarters.
A WEAKLY TURBULENT FLAME WITH HIGH ACTIVATION ENERGY
Forman A. Williams (Calif. Univ., La Jolla) Jul. 1973 55 p refs
(Contract N00014-67-A-0226-0005; NR Proj. 098-038)
(AD-763340; SQUID-TR-UCSD-4-PU) Avail: NTIS CSCL 21/2

A previously outlined approach to turbulent flame theory is

extended to premixed combustibles with high activation energy. Emphasis is placed primarily on turbulence whose integral scale is large compared with the thickness of the laminar flame. Only the limit of low intensity for the turbulence is considered. The two-zone structure of the turbulent flame parallels that of a laminar flame. In the diffusion zone, velocity fluctuations act on the mean concentration gradient to generate concentration fluctuations, which persist in the reaction zone to perturb the profile of mean concentration there: This turbulent modification to the mean reaction-zone structure produces a turbulent correction to the flame speed, which is calculated. It was found that an increase in the ratio of the rms velocity fluctuation to the laminar flame speed, an increase in the ratio of the turbulence macroscale to the laminar flame thickness, or an increase in the ratio of the activation temperature to the flame temperature, generally will cause an increase in the ratio of the turbulent flame speed to the laminar flame speed. (Modified author abstract) GRA

N73-30890# Hercules, Inc., Magna, Utah. Bacchus Works.
EXPLOSIVE MAGNETOHYDRODYNAMIC PROGRAM Technical Report 2 Jan. - 1 Oct. 1972
C. D. Bangerter, L. R. West, T. R. Brogan, D. B. Sheldon, and Z. Stekly May 1973 256 p refs
(Contract F33615-72-C-1394; ARPA Order 2357; AF Proj. 3145)
(AD-762934; H500-12-3-1; AFAPL-TR-73-16) Avail: NTIS CSCL 10/2

The report is basically an analytic study with the addition of design and experimental data required to augment the study. The analysis presented is conclusive in its finding that the X-MHD is a highly versatile prime power source which can be operated without benefit of vacuum equipment in residual ambient pressure gases of various composition and at high repetition rate with various loads. At high repetition rate, the spent explosion products of a previous round are an ideal residual or purge gas. Energy conversion efficiency in excess of 10% should be attainable with optimized residual gases at ambient pressure, and 5-10% with spent explosion product residual gases at field levels currently achieveable with superconducting magnets. (Modified author abstract) GRA

N73-30891# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
CHARACTERIZING VEGETATION FROM EXISTING SOURCE MATERIAL FOR PREDICTING MUNITION HEIGHT OF BURST IN INACCESSIBLE AREAS Final Report
Hollis H. Allen and John G. Collins Jun. 1973 51 p refs
(AD-763179; AEWES-Misc-Paper-M-73-8) Avail: NTIS CSCL 19/4

In the report a procedure for characterizing vegetation of inaccessible areas for input to munition height-of-burst models was developed. The procedure entails three steps: statistical stratification, vegetation sampling, and vegetation data transformation. An area is stratified on the basis of average height, crown diameter, and spacing of plants in the upper two layers using the WES factor mapping process. For each unique combination of factors mapped, a 20-plant minimum sample is taken for each height layer. Sample data include average spacing of plants and the height and crown diameter of each plant. Data are obtained photogrammetrically when feasible; otherwise, available ground-truth data are substituted. Plants with known stem and branch geometries are then substituted for the sample plants. Author (GRA)

34 GENERAL

Includes information of a broad nature related to industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N73-30892# Committee on Appropriations (U. S. House).
NASA AUTHORIZATION OF APPROPRIATIONS FOR FISCAL YEAR 1974
Olin E. Teague Washington GPO 28 Jun. 1973 12 p Report to accompany H.R. 7528 presented by the Comm: of Conf. at the 93d Congr., 1st Sess., 28 Jun. 1973
(H-Rept-93-353) Avail: US Capitol, House Document Room

The report of a Congressional committee to resolve disagreement concerning the NASA appropriations for Fiscal Year 1974 is submitted. Amounts for research and development projects, test facilities, training devices, and installations are specified. The fiscal points in disagreement are identified and the recommendations for resolving the problem are developed. Author

N73-30893# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE, SCIENTIFIC AFFAIRS, NO. 339
25 Jul. 1973 55 p Transl. into ENGLISH from various eastern European publications
(JPRS-59617) Avail: NTIS HC $4.75

Research projects in various theoretical and applied scientific disciplines and technical fields conducted in Eastern Europe are reported. The subjects discussed include the following: (1) hydrometeorology, (2) composition of certain groups of drugs, (3) semiconductor materials technology, (4) microelectronics developments, (5) development of electron tubes, (6) piezoelectronics and acoustoelectronics, and (7) development of magnetically soft ferrite materials. For individual titles, see N73-30894 through N73-30902.

N73-30894 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF SEMICONDUCTOR MATERIALS TECHNOLOGY **c26**
Bohdan Paszkowski *In its* Transl. on Eastern Europe, Sci. Affairs, No. 339 (JPRS-59617) 25 Jul. 1973 p 15-17 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 11-15 (For availability see N73-30893 21-34)

The activities of various Polish research facilities in the development of semiconductor materials are discussed. One project involves intermetallic compounds with a narrow forbidden band and the determination of the band structure of mercury telluride and cadmium telluride as well as their solid solutions. A method for measuring the properties of these substances at high pressure is described. Other research projects involve: (1) synthesis of gallium arsenides and gallium phosphides for semiconductor application, (2) monocrystallization of silicon, and (3) growth of silicon crystals. P.N.F.

N73-30895 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF SEMICONDUCTOR TECHNOLOGY **c26**
Witold Rosinski *In its* Transl. on Eastern Europe, Sci. Affairs, No. 339 (JPRS-59617) 25 Jul. 1973 p 18-21 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 15-20 (For availability see N73-30893 21-34)

Polish research projects involving the design and technology of semiconductor devices are discussed. The research projects reported are as follows: (1) growth of epitaxial layers, especially of intermetallic compounds and heterolayers, (2) applications of ion implantation in semiconductor devices for precise proportioning and localization of impurities, (3) improvements in the stability of thin dielectric layers associated with the quality of metal oxide semiconductor field transistors, (4) electron storage for memory purposes, and (5) application of semiconductor devices for microwave generation. P.N.F.

N73-30896 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF MICROELECTRONICS **c10**
Andrzej Ambroziak *In its* Transl. on Eastern Europe, Sci. Affairs, No. 339 (JPRS-59617) 25 Jul. 1973 p 22-23 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 21-28 (For availability see N73-30893 21-34)

The status of the development of microelectronics in Poland is discussed. Emphasis is placed on the capability to produce integrated circuits. A comparison is made between the Polish capabilities and those of the United States to produce electronic devices. P.N.F.

N73-30897 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF SOLID STATE MICROWAVE ELEC-

TRONICS c10
Adam Smolinski *In its* Transl. on Eastern Europe, Sci. Affairs, No. 339 (JPRS-59617) 25 Jul. 1973 p 24-28 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 28-32 (For availability see N73-30893 21-34)

The development of solid state microwave electronics equipment in Poland is discussed. The various research facilities and their areas of responsibility are identified. The selection of appropriate research efforts in microwave electronics is described. The tasks of research institutes and educational facilities for microwave research and development are reported. P.N.F.

N73-30898 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF SEMICONDUCTOR OPTOELECTRONICS c26
Bohdan Mroziewicz *In its* Transl. on Eastern Europe, Sci. Affairs, no. 339 (JPRS-59617) 25 Jul. 1973 p 29-35 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 33-37 (For availability see N73-30893 21-34)

The development of a semiconductor optoelectronics capability in Poland is discussed. Optoelectronic components developed and produced in Poland are identified. A diagram of the problems which are related to the development and application of optoelectronics is developed. The research projects which are considered essential to developing optoelectronics systems are reported. P.N.F.

N73-30899 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF ELECTRON TUBES c10
Jan Hennel *In its* Transl. on Eastern Europe, Sci. Affairs, No. 339 (JPRS-59617) 25 Jul. 1973 p 36-37 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 44-47 (For availability see N73-30893 21-34)

The institutions which are responsible for the development of electron tubes in Poland are identified. The anticipated decrease in the requirements for electron tubes and the impact on manufacturing are analyzed. Proposals to re-direct the efforts of the research facilities to compensate for the loss of electron tube requirements are submitted. P.N.F.

N73-30900 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF MICROWAVE TUBES c10
Lech Sokolowski *In its* Transl. on Eastern Europe, Sci. Affairs, No. 339 (JPRS-59617) 25 Jul. 1973 p 38-40 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 47-50 (For availability see N73-30893 21-34)

Polish scientific accomplishments for research and development of microwave tubes are discussed. The institutions involved in microwave tube development and their assigned functions are described. Anticipated changes in the research and development requirements are analyzed and recommendations for suitable research and development projects are submitted. P.N.F.

N73-30901 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF PIEZOELECTRONICS AND ACOUSTOELECTRONICS c26
Wincenty Pajewski *In its* Transl. on Eastern Europe, Sci. Affairs, No. 339 (JPRS-59617) 25 Jul. 1973 p 41-47 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 50-54 (For availability see N73-30893 21-34)

The development of piezoelectronics and acoustoelectronics in Poland and their application to communications systems are discussed. Research projects on the improvement of piezoelectric devices are reported. The application of acoustoelectronic components in computers, high capacity memories, convolutional circuits, discriminators, and signal conversion is examined. Specific research efforts for the improvement and application of piezoelectronic and acoustoelectronic devices are suggested. P.N.F.

N73-30902 Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF MAGNETICALLY SOFT FERRITE MATERIALS c26
Tomasz Postupolski *In its* Transl. on Eastern Europe, Sci. Affairs, No. 339 (JPRS-59617) 25 Jul. 1973 p 48-52 Transl. into ENGLISH from Elektron. (Warsaw), no. 1-2, Jan.-Feb. 1973 p 62-66 (For availability see N73-30893 21-34)

Polish institutions involved in research projects for developing magnetically soft ferrite materials are identified. The overall domestic situation with respect to ferrite development is analyzed. Recommendations for research and development efforts to improve the status of ferrite materials development and application are submitted. P.N.F.

N73-30903# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 343
3 Aug. 1973 43 p refs Transl. into ENGLISH from Eastern European publications
(JPRS-59709) Avail: NTIS HC $4.25

Microwave radiation effects on rat tissues and their length of survival are examined. The U.S., Soviet, and Polish standards for tolerable levels of microwave radiation for humans are also presented. For individual titles, see N73-30904 through N73-30905.

N73-30904 Joint Publications Research Service, Arlington, Va.
CURRENT RESEARCH RESULTS AND FUTURE EFFORTS IN THE PROBLEM OF THE BIOLOGICAL EFFECT OF MICROWAVE RADIATION IN THE DEPARTMENT OF PHYSICAL INJURY AT THE INSTITUTE OF INDUSTRIAL MEDICINE c04
Henryk Mikolajczyk *In its* Transl. on Eastern Europe: Sci. Affairs, No. 343 (JPRS-59709) 3 Aug. 1973 p 4-15 refs Transl. into ENGLISH from Med. Lotnicza (Warsaw), no. 39, 1972 p 95-104 Presented at Symp. on the Biol. Effect of Microwaves, the Employment of Lasers in Biol. and Med., and Protection against Nonionizing Radiation, Warsaw, 28-30 Oct. 1971 (For availability see N73-30903 21-34)

Adrenal cortex activity in rats exposed to microwave radiation and microscopic appearance of mast cells in the mesentery of small intestines of rats exposed to thermal doses of microwave radiation are described. Mitotic division of epithelial cells of cornea and survival duration of normal rats and rats without pituitaries are studied in a microwave radiation field. The effect of acetylcholine, epinephrine, histamine, and serotonin on length of survival to radiation exposed rats is also investigated. J.A.M.

N73-30905 Joint Publications Research Service, Arlington, Va.
PROPOSALS FOR SPECIFICATION OF ALLOWABLE LEVELS OF MICROWAVE RADIATION c04
Przemyslaw Czerski and Mieczyslaw Piotrowski *In its* Transl. on Eastern Europe: Sci. Affairs, No. 343 (JPRS-59709) 3 Aug. 1973 p 16-28 refs Transl. into ENGLISH from Med. Lotnicza (Warsaw), no. 39, 1972 p 127-139 (For availability see N73-30903 21-34)

The U.S. and Soviet standard radiation levels allowable for humans are discussed, including substantiation of these levels. Polish standards for permissible exposure to microwave radiation are also presented. J.A.M.

N73-30906# Committee on Aeronautical and Space Sciences (U. S. Senate).
NASA AUTHORIZATION FOR FISCAL YEAR 1974, PART 1
Washington GPO 1973 578 p refs Hearings on S. 880 before Comm. on Aeron and space Sci., 93d Congr., 1st Sess., 28 Feb., 6-7 and 9 Mar. 1973 3 Vol.
Avail: SOD HC $2.60 Domestic Postpaid or $2.25 GPO Bookstore

Congressional hearings to authorize appropriations to NASA for research and development during Fiscal Year 1974 are presented. NASA activities for FY 1973 are discussed and funding implications for FY 1974 are derived. Charts, photographs, and drawings of NASA projects are included. Specific testimony is submitted on the Skylab program, the Space Shuttle program, and the Earth Resources Technology Satellite program. For Part 2 see N73-23960. Author

N73-30907# Committee on Aeronautical and Space Sciences (U. S. Senate).
NASA AUTHORIZATION FOR FISCAL YEAR 1974, PART 3
Washington GPO 1973 446 p refs Hearings on S.880 before Comm. on Aeron. and Space Sci., 93d Congr., 1st Sess., 3-4 and 10 Apr. 1973 3 Vol.

Avail: SOD HC $2.60 Domestic Postpaid or $2.25 GPO Bookstore

Congressional hearings concerning appropriations for NASA operations during Fiscal Year 1974 are presented. The subjects discussed are: (1) Soviet space activities in 1972, (2) Department of Defense Space activities, (3) Department of Defense Aeronautical activities, and (4) coordination and cooperation with NASA. The data consist primarily of testimony by selected witnesses to substantiate claims for funds. Author

N73-30908# National Science Foundation, Washington, D.C.
GRADUATE STUDENT SUPPORT AND MANPOWER RESOURCES IN GRADUATE SCIENCE EDUCATION, FALL 1971
Penny D. Foster Mar. 1973 97 p refs
(NSF-73-304) Avail: SOD HC $1.25 Domestic Postpaid or $1.00 GPO Bookstore

The utilization of the Nation's resources for science by graduate students was analyzed. The characteristics of the graduate science student population, science faculty, and postdoctoral appointees are reported, and trends are examined. The data on graduate enrollments are considered highly representative of total U.S. graduate enrollment in the sciences and engineering. Four principal characteristics of graduate students enrolled in doctorate science departments are examined: enrollment status (full-or-part time); distribution among fields of science; level of study (first year or beyond); and citizenship. Author

N73-30909# National Transportation Safety Board, Washington, D.C.
THE SAFETY BOARD Annual Report, 1972
1972 70 p
Avail: SOD $0.55

The National Transportation Safety Board reported to Congress, concerning the work they had performed in 1972. Their investigations into air taxi safety, the Chicago train crash, and pipeline damage and rapid shutdown are highlighted. Problem areas and investigations into aviation and surface transportation safety are reported. Their recommendations for legislation and rulemaking are presented, along with certificate and license appeals of airmen and seamen. J.A.M.

N73-30910# Witwatersrand Univ., Johannesburg (South Africa). School of Mechanical Engineering.
GOLDEN JUBILEE RESEARCH BULLETIN
Apr. 1972 43 p refs
(ISBN-0-85494-200-9; Rept-52) Avail: NTIS HC $4.25

Current research in mechanical engineering is reported. The projects are described, and publications resulting from the research are given. F.O.S.

N73-30911# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 349
16 Aug. 1973 26 p Transl. into ENGLISH from various Eastern European publications
(JPRS-59825) Avail: NTIS HC $3.50

The proceedings from a meeting of the planetary geophysical research committee are presented, along with characteristics for third generation computers. Computer courses for programmers and operators are also discussed. For individual titles, see N73-30912 through N73-30914.

N73-30912 Joint Publications Research Service, Arlington, Va.
EIGHTH SESSION OF PLANETARY GEOPHYSICAL RESEARCH COMMITTEE REPORTED c13
Istvan Joo *In its* Transl. on Eastern Europe: Sci. Affairs, No. 349 (JPRS-59825) 6 Aug. 1973 p 3-6 Transl. into ENGLISH from Geod. Kartografia (Budapest), no. 3, 1973 p 206-207 (For availability see N73-30911 21-34)

A committee meeting on planetary geophysical research is reported during 3-12 April 1973. A map of the recent vertical crustal movements in Eastern Europe was prepared. Ebbs and tides were also studied. J.A.M.

N73-30913 Joint Publications Research Service, Arlington, Va.
UNIFIED COMPUTER SYSTEM (RYAD) DESCRIBED c08
In its Transl. on Eastern Europe: Sci. Affairs, No. 349 (JPRS-59825) 6 Aug. 1973 p 7-11 Transl. into ENGLISH from Inform. -- Elektron. (Budapest), no. 2, 1973 p 123-125 (For availability see N73-30911 21-34)

Characteristics of third generation computers are described, along with external memories, input/output equipment, and data transmission equipment. The operating systems and application programs for software are also considered. J.A.M.

N73-30914 Joint Publications Research Service, Arlington, Va.
INFORMATION, STATISTICS ON HUNGARIAN COMPUTER COURSES PRESENTED c08
Adorjan Palfi *In its* Transl. on Eastern Europe: Sci. Affairs, No. 349 (JPRS-59825) 6 Aug. 1973 p 12-20 Transl. into ENGLISH from Inform. -- Elektron. (Budapest), no.2, 1973 p 135-138 (For availability see N73-30911 21-34)

Computer courses for professional training are discussed, including courses for programmers and operators. Special and refresher courses for practical experts are described, as well as general computer orientation courses. J.A.M.

N73-30915*# Drexel Univ., Philadelphia, Pa.
INTERVENTION INTO A TURBULENT URBAN SITUATION: A CASE STUDY Ph.D. Thesis
G. Mason Caldwell, Jr. Jun. 1973 187 p refs
(Grant NGL-39-004-020)
(NASA-CR-133830) Avail: NTIS HC $11.50 CSCL 05K

The application is reported of NASA management philosophy and techniques within New Castle County, Delaware, to meet actual problems of community violence. It resulted in restructuring the county approach to problems of this nature, and development of a comprehensive system for planning, based on the NASA planning process. The method involved federal, state, and local resources with community representatives in solving the problems. The concept of a turbulent environment is presented with parallels drawn between NASA management experience and problems of management within an urban arena. Author

N73-30916# Committee on Aeronautical and Space Sciences (U. S. Senate).
TOWARD A BETTER TOMORROW WITH AERONAUTICAL AND SPACE TECHNOLOGY From Hearings on Fiscal Year 1974 NASA Authorization Act
Washington GPO 1973 206 p refs Hearings before Comm. on Aeron. and Space Sci., 93d Congr., 1st Sess., 6 and 14 Mar. 1973
Avail: SOD HC $1.55

A Congressional hearing to review the accomplishments of NASA and to forecast the expected future accomplishments was held. Reports submitted on NASA contributions to aviation and space flight are presented. The impact of NASA programs on industry and the civilian community are analyzed. The benefits to be derived from artificial satellite programs are explained. Examples of technology utilization and transfer are submitted. The desirability of publicizing the space program benefits is stressed. Author

N73-30917# National Aeronautical Lab., Bangalore (India).
[RESEARCH PROGRESS IN AERODYNAMICS, PROPULSION, ELECTRONICS, INSTRUMENTATION, AND MATHEMATICAL SCIENCES] Annual Report, 1971 - 1972
1972 91 p refs
Avail: NTIS

Research activities are discussed, including topics such as: aerodynamics, propulsion, structural sciences, materials science, electronics, instrumentation, and mathematical sciences. Pilot plant projects are also reviewed. Members of the executive council and research teams are mentioned, as well as various publications and seminars. J.A.M.

N73-30918# Federal Aviation Administration, Washington, D.C.
ENGINEERING AND DEVELOPMENT PROGRAM PLAN: PROGRAM STRUCTURE AND OBJECTIVES
1 Jul. 1973 40 p
(FAA-ED-00-A) Avail: NTIS $4.00

Program plans are presented covering the present twenty-two engineering and development programs within the Federal Aviation Administration. These plans are required to provide more detailed information on the objectives, goals, program structure, technical approach, resources, possible implementation, and a number of other aspects for each of these programs. This planning process has been formalized in order to provide a record of the status and availability of each plan. An introductory background is presented to the planning process, the objectives in each of the program areas, and an index of the plans, available or under preparation. Author

N73-30919# Advisory Group for Aerospace Research and Development, Paris (France).
AGARD BULLETIN: MEETINGS, PUBLICATIONS AND MEMBERSHIP
Jan. 1973 68 p refs
(AGARD-Bul-73/1) Avail: NTIS HC $5.50

Information is presented on all the planned 1973 AGARD meetings, including dates, locations, and brief descriptions of their themes. Also included is a list of AGARD publications, released in 1972, together with their abstracts. Author

N73-30920# Committee on Commerce (U. S. Senate).
METRIC CONVERSION
Washington GPO 1972 330 p refs Hearing on S. 2483 and S. J. Res. 219 before Comm. on Com., 92d Congr., 2d Sess., 29 Feb. - 1 Mar. 1972
Avail: SOD HC $1.25

A Congressional committee hearing on conversion to metric units is presented. The purpose of the hearing was to provide a national program in order to make the international metric system the official and standard system of measurement in the United States. The legislation is also designed to provide for converting to the general use of metric system within ten years after the date of enactment of the law. The findings of the committee are primarily based on testimony provided by experts in the field of metrology. Author

N73-30921# Committee on Science and Astronautics (U. S. House).
NASA AUTHORIZATION, 1974: INDEX FOR PARTS 1, 2, 3, AND 4
Washington GPO 1973 285 p refs Index for hearings on H.R. 4567 (superseded by H.R. 7528) before Comm. on Sci. and Astronaut., 93d Congr., 1st Sess.
Avail: Comm. on Sci. and Astronaut.

An index of the subjects discussed in the Congressional hearings for the NASA appropriation for Fiscal Year 1974 is submitted. All on-going and proposed research and development programs are identified. All subjects covered during the testimony of selected witnesses are indexed. P.N.F.

N73-30922# Committee on Science and Astronautics (U. S. House).
CONVERSION TO THE METRIC SYSTEM OF WEIGHTS AND MEASURES
Washington GPO 1973 671 p refs Hearings before Comm. on Sci. and Astronaut., 93d Congr., 1st Sess., No. 3, 19-22 Mar. and 9-10 May 1973
Avail: Subcomm. on Sci., Res., and Develop.

Congressional hearings to determine the feasibility and desirability of converting to the metric system in United States industry are presented. The bill to establish a national policy relating to conversion to the metric system is reported. The establishment of a national metric conversion board is proposed and its functions are defined. Applications of the metric system and comparisons with the English system are explained. The hearings consist primarily of testimony by recognized experts in the field of metrology and industry. Author

N73-30923*# Colorado Univ., Boulder. Lab. for Atmospheric and Space Physics.
[PLANETARY ATMOSPHERIC PHYSICS AND SOLAR PHYSICS RESEARCH] Annual Report, 1972-1973
Jun. 1973 58 p refs
(Grants NGL-06-003-052; NGL-06-003-064; NGR-06-003-127)
(NASA-CR-133773) Avail: NTIS HC $5.00 CSCL 14B

An overview is presented on current and planned research activities in the major areas of solar physics, planetary atmospheres, and space astronomy. The approach to these unsolved problems involves experimental techniques, theoretical analysis, and the use of computers to analyze the data from space experiments. The point is made that the research program is characterized by each activity interacting with the other activities in the laboratory. Author

N73-30924# Cornell Univ., Ithaca, N.Y. Materials Science Center.
[RESEARCH REPORTS IN APPLIED AND ENGINEERING PHYSICS, CHEMISTRY, ELECTRONICS, AND MATERIAL SCIENCE] Annual Technical Progress Report, 1 Jul. 1971 - 30 Jun. 1972
30 Jun. 1972 136 p refs
(Contract DAHC15-67-C-0214)
(AD-763501) Avail: NTIS CSCL 05/2

The Technical Progress Report for 1971-1972 is intended to give a condensed account of the research activities of all the members of the Materials Science Center, their associates, and their graduate students. It consists of summaries of the research objectives and progress and publications issued during the year. GRA

N73-30925# Factory Mutual Research Corp., Norwood, Mass.
FIRE PROTECTION STUDY: USAF MOBILITY PROGRAM STRUCTURES AND LARGE AIR FORCE WAREHOUSES Technical Report on Phase 2, Nov. 1971 - Nov. 1972
L. M. Krasner and D. G. Goodfellow Kirtland AFB, N. Mex. AFWL May 1973 70 p refs
(Contract F29601-70-C-0082; AF Proj. 683M)
(AD-762948; AFWL-TR-72-246) Avail: NTIS CSCL 13/12

The report describes the second phase of a fire protection study comprising: (1) evaluation of self-contained portable extinguishing systems meeting specific criteria for the protection of Air Force Mobility Program structures (Potential alternative protection systems are described, compared, and discussed for the various types of bare-base structures. The discussion includes inert gas systems, low expansion foam systems, high expansion foam systems, dry chemical systems and vaporizing liquid systems); and (2) the development of a 0.64-inch orifice upright prototype sprinkler for Air Force warehouse retrofit applications. The success criteria were based upon penetration, drop size, and distribution data previously generated for a pendent version of a large orifice retrofit sprinkler. Nonfire tests were conducted to monitor changes in the above parameters as design changes were instituted. These tests are described and discussed in detail. A successful large-scale fire test was conducted which verified initial findings. Author (GRA)

N73-30321 Joint Publications Research Service, Arlington, Va.
SELECTION OF STANDARD SECTIONS AND ORGANIZATION OF OPERATIONS IN THEM
In its Meeting of the Sov.-Am. Working Group on Remote Sensing of the Nat. Environment from Space (JPRS-59739) 8 Aug. 1973 p 31-33 Transl. into ENGLISH from the publ. "Vstrecha Sovetsko-Amerikanskoy Rabochey Gruppy po Issledovaniyu Okruzhayushchey Sredy iz Kosmosa" Moscow, Acad. of Sci. USSR, 1973 (For availability see N73-30317 21-13)

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